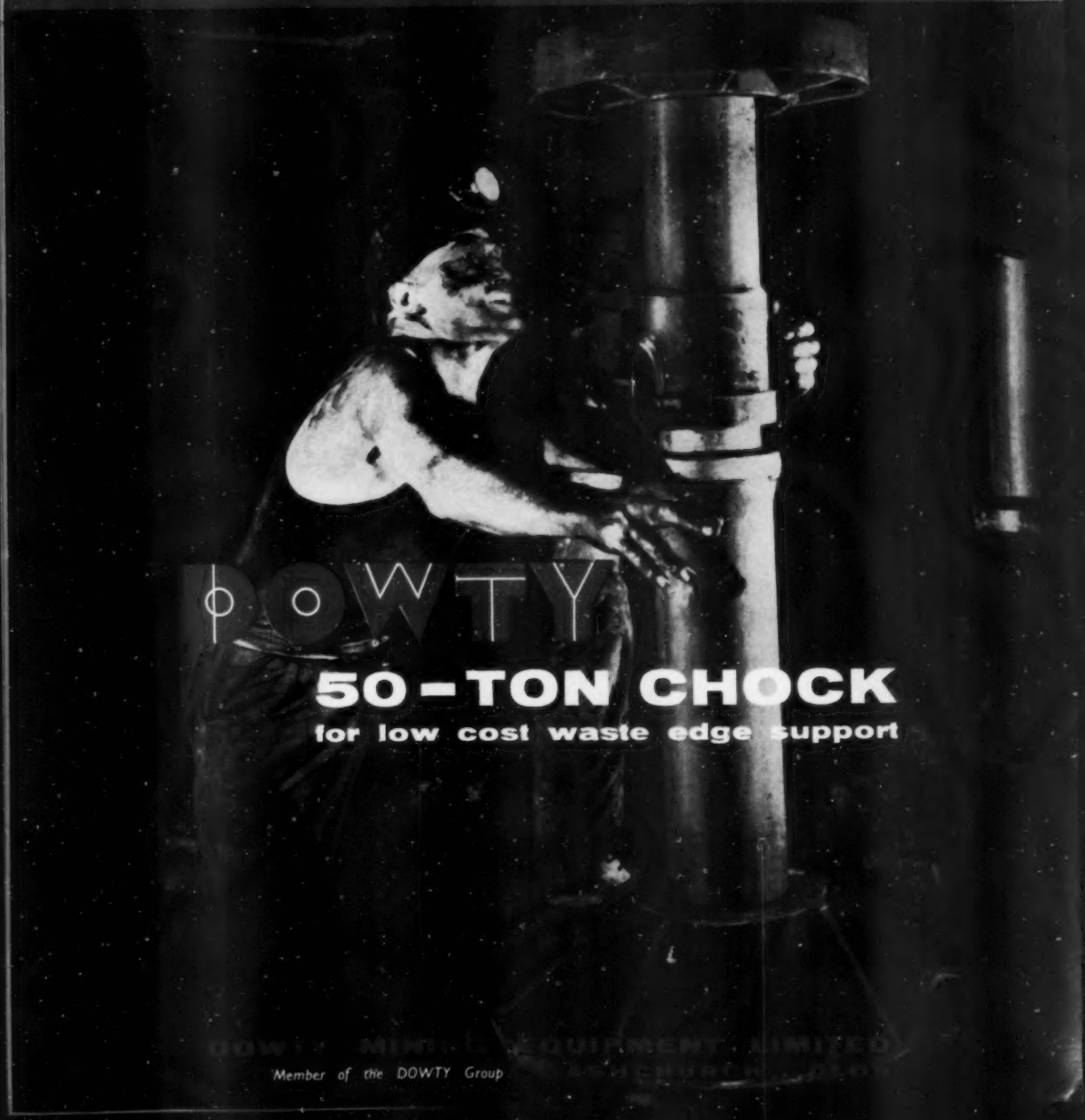
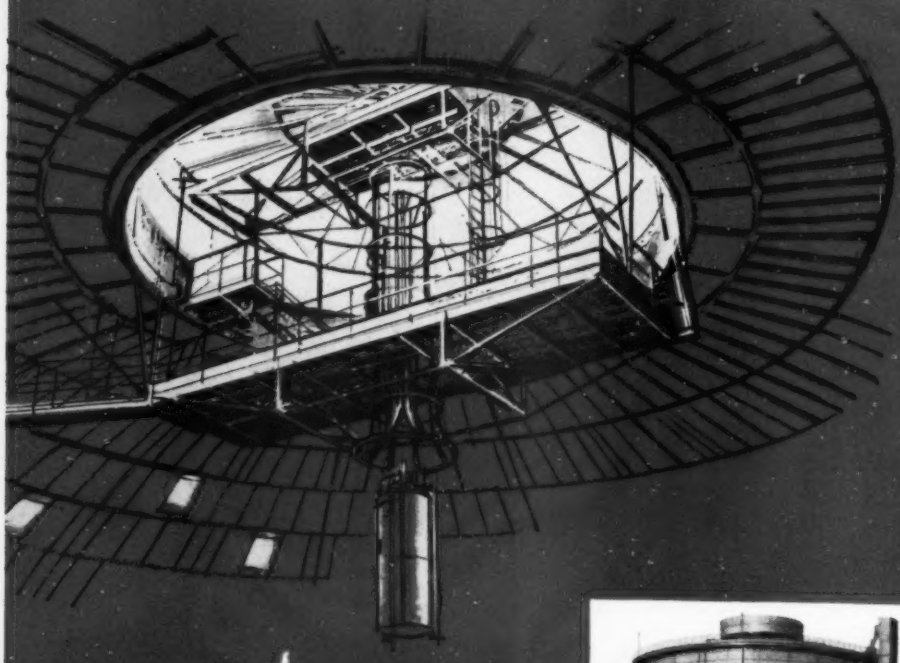
# IRON & COAL

THE IRON AND COAL TRADES' REVIEW



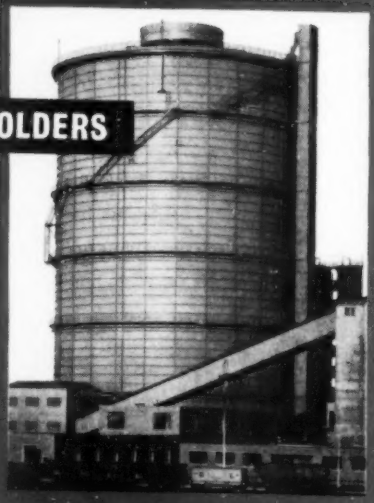




## ABP-KLONNE TYPE DRY GASHOLDERS

**RECENT CONTRACTS**

| Town | Capacity (cu. ft.) | Gas Stored |
|---|---|---|
| Ashton | 1 million | Blast furnace |
| Middlesbrough | 3 million | Coke oven |
| Middlesbrough | 5 million | Blast furnace |
| Motherwell | 1 million | Coke oven |
| Motherwell | 5 million | Blast furnace |
| Middlesbrough | 3 million | Blast furnace |
| West Hartlepool | 3 million | Blast furnace |
| Dagenham | 5 million | Coke oven |
| Dagenham | 5 million | Coke oven |
| Scunthorpe | 3 million | Coke oven |
| Corby | 2 million | Coke oven |
| Newport | 5 million | Blast furnace |
| Newport | 2 million | Coke oven |
| Scunthorpe | 3 million | Blast furnace |



For further information write for brochure.

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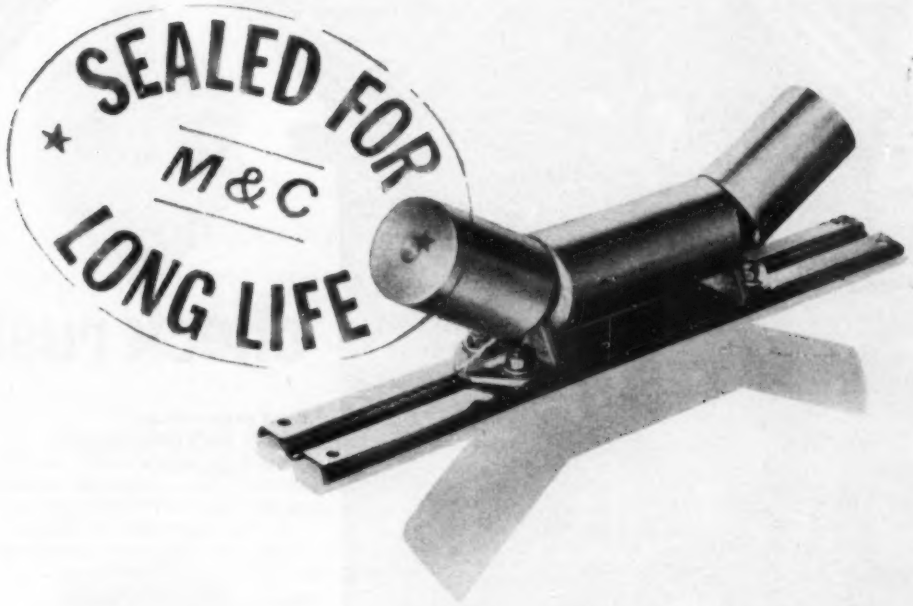


M&C belt conveyor idlers arrive with labyrinths full of soft grease, to keep the ball bearings free from dust, dirt and grit. Without needing so much as a kind look, they give this protection throughout a long working life. Refreshed occasionally by a shot from the gun, they keep it up many times as long, in fact as long as you like. These perpetual seals are almost frictionless. They enable hard-working M&C idlers twenty years old to spin at a touch. Mavor & Coulson Ltd., Bridgeton, Glasgow S.E., Olive Grove Rd. Sheffield 2, 36 Victoria St. London S.W.1.

MAVOR & COULSON LTD

1

Croda

check rust

**Rust preventives:**
Most of the Croda range are based on lanolin called the finest organic metal protective compound by the National Physical Laboratory. As manufacturers of lanolin, Croda can offer rust preventives at highly competitive prices.

**Metacon rust remover:**
not only removes all rust from ferrous metals but also in the same operation gives the metal a rust preventive coating.

**Strippable coatings: Crocell:**
hot dip thermoplastic coating protects metal parts from corrosion and mechanical damage.

**Rhinohide:**
tough plastic applied by spraying, protects large parts.

**Dewatering rust preventives:**
lanolin based dewatering oils remove all moisture from metal and leave an oily preventive film on the surface.

**Magisol:**
special solvent blend removes grease and oil from metal surfaces.

*Croda Ltd., Cowick Hall, Snaith, Goole, Yorks; and London, Manchester, Edinburgh, Dusseldorf, Milan, New York*

Flame cutting
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MILD STEEL FABRICATIONS

Bunkers, hoppers, chutes, furnace cases and pipework specials in M.S. plate up to ½" thick or to any specification. Ultimate capacity, in one piece, 9 tons.

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incorporating W.T.SEYMOUR (STOCKTON) LTD.
part of the FORSTER group
SEAHAM, CO. DURHAM. Telephone 2321

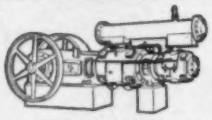
# An UNDERGROUND COMPRESSOR

## that's COOL as well as COMPACT

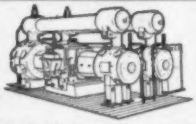
LOW HEIGHT ROTARY COMPRESSOR for UNDERGROUND MINING

Specially designed as a low-height mine car unit, this Class RE 'Power Vane' Rotary Electric Compressor has the compact appearance typical of this type of machine. Another special feature is cool running—the discharge temperature being some 100°F lower than that of any equivalent reciprocating compressor. Standard models may be air or water-cooled, and flameproof drive and full protection equipment is fitted for safe, underground service As rotary units, there are no pistons, valves or crankshaft to go wrong, and maintenance is simplified. 'Power Vane' Compressors are available for service up to 500 c.f.m. at normal working pressures. *Full technical literature on request.*

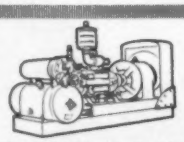
*THERE IS A CP COMPRESSOR FOR EVERY TYPE OF DUTY*



CLASS T straight-line, double-acting, single and multi-stage compressors for outputs up to 745 c.f.m. or pressures up to 2,500 p.s.i.



CLASS FE balanced-opposed multi-cylinder compressors for outputs up to 8,000 c.f.m. or pressures up to 3,000 p.s.i.

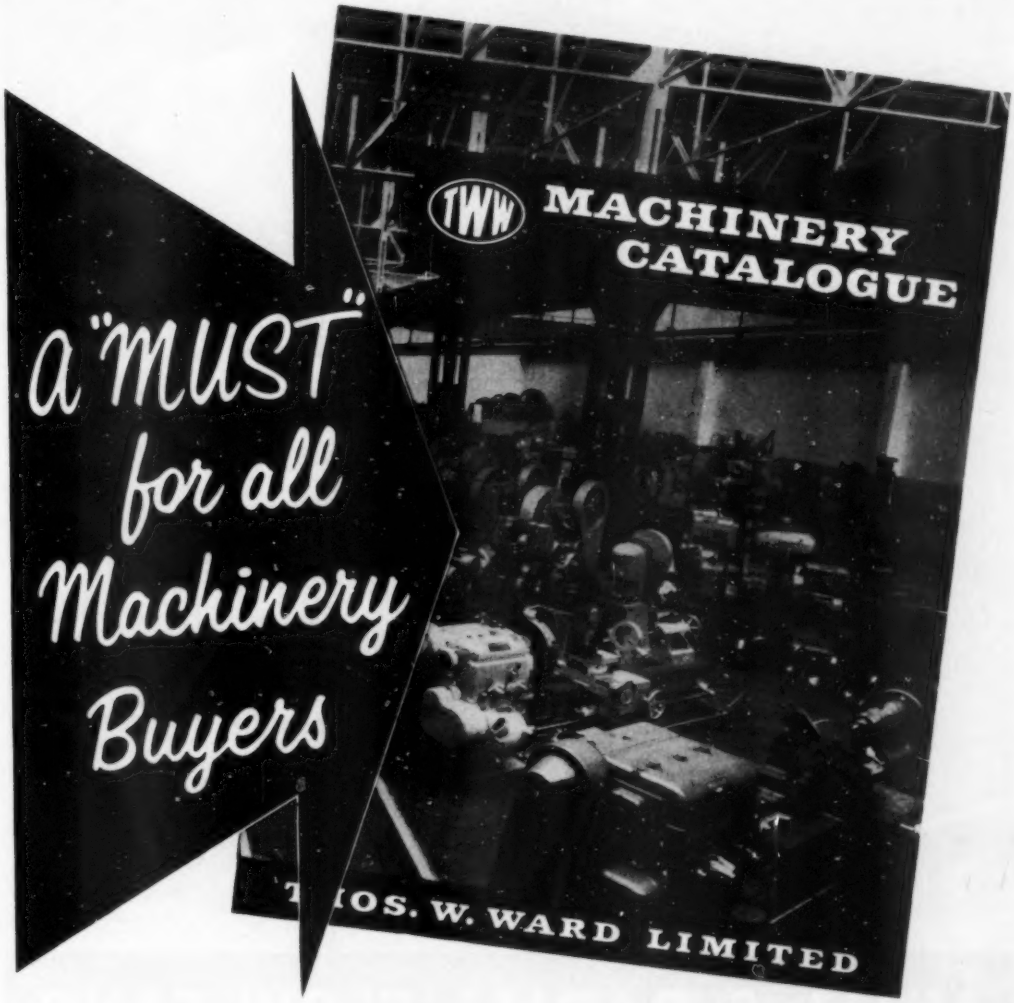


CLASS RE electrically driven Rotary Air Compressors for outputs up to 510 c.f.m. at 100 p.s.i.

CLASS P two stage air-cooled compressors for outputs up to 477 c.f.m. at 100 p.s.i.

Consolidated Pneumatic

CONSOLIDATED PNEUMATIC TOOL CO. LTD · DAWES ROAD · LONDON · S.W.6

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# Individually designed to suit specific conditions

*AND TO ACHIEVE*

- HIGH EFFICIENCY
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- ECONOMIC RUNNING COSTS
- LOW MAINTENANCE

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**First for all Fan requirements**

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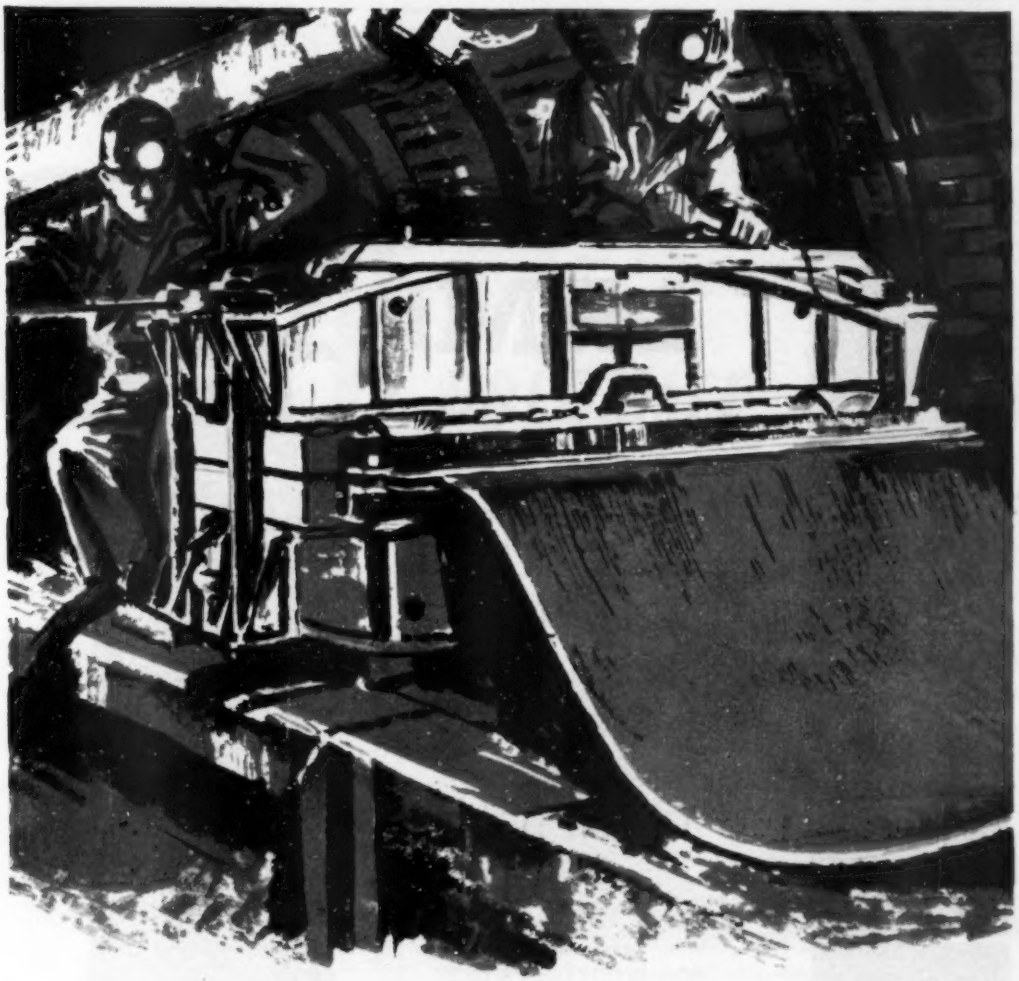

# CUT CONVEYING COSTS

## SPLICED JOINTS FOR STRENGTH AND SMOOTH RUNNING

Stoppage of production to replace worn or damaged metal fasteners is eliminated when a belt is jointed by splicing. Such a belt is virtually homogeneous along its entire length and this gives longer and better service. Uninterrupted belt life and smoother running follow from 'on-site' vulcanising carried out by the Silvertown Mobile Splicing Service . . . one of the advantages enjoyed by users of Silvertown conveyor belting. Reduce your 'cost to produce' by specifying . . .

**Silvertown**

SILVERTOWN RUBBER CO. LTD, HERGA HOUSE, VINCENT SQUARE, LONDON S.W.1

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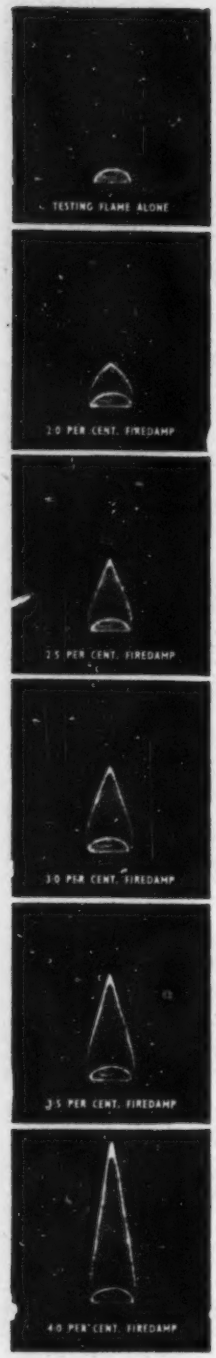


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# PROTECTOR LAMP

*The Finest GAS DETECTOR in the World*

**TYPE 6**
With Flint Relighter
FOR OFFICIALS' USE
(AS ILLUSTRATED)

**TYPE S.L.**
With Platinum Wire Ignition
FOR WORKMEN'S USE

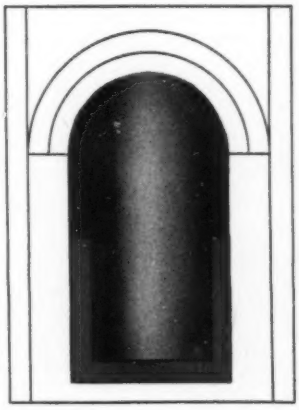
## THE PROTECTOR LAMP & LIGHTING COMPANY LTD

ECCLES, Nr. MANCHESTER
Telephone: ECCLES 3013

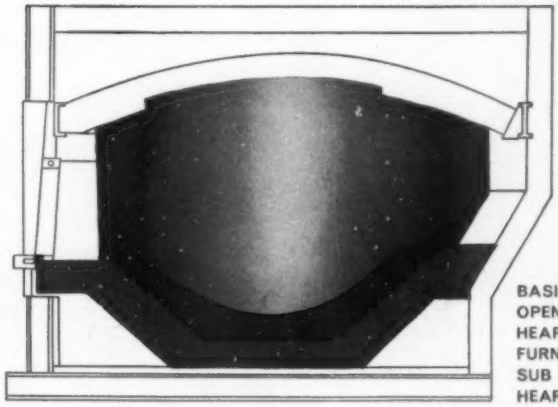
**'341'** DOLOMITE bricks are manufactured from a dolomite limestone which in the natural state approaches in chemical composition the mineral dolomite $CaCO_3$. $M_3CO_3$. The raw dolomite is dead-burned at high temperatures and it is then formed into suitable shapes, by a new and unique brick-making process. Tunnel kiln firing at high temperatures produces a dense, volume stable and truly basic refractory of exceptional quality. '341' DOLOMITE bricks are resistant to hydration and they can be transported and stocked in the same way as other basic bricks. '341' DOLOMITE bricks are manufactured in various sizes designed to suit many applications.

# G.R.'341' DOLOMITE BRICKS

## for BASIC OPEN HEARTH FURNACES



BASIC OPEN HEARTH SLAG POCKET



BASIC OPEN HEARTH FURNACE SUB HEARTH

'341' DOLOMITE BRICKS
RAMMED DOLOMITE

*'341' DOLOMITE bricks have proved to be ideal for use in modern O.H. units, particularly in sub hearths and slag pockets. In slag pockets these bricks contain the slag during operation — but form a means of speeding up slag removal at the end of the campaign. ('341' bricks hydrate with water to disrupt and break up the slag.)*

### Typical Chemical Analysis

| $SiO_2$ | $TiO_2$ | $Fe_2O_3$ | MnO | $Al_2O_3$ | CaO | MgO |
|---|---|---|---|---|---|---|
| 2/3% | 0.2% | 1/2% | 0.1% | 1/2% | 48/50% | 36/40% |

### Typical Physical Properties

| | |
|---|---|
| TRUE POROSITY % | 18/20 |
| BULK DENSITY grams per c.c. | 2.70/2.75 |
| SPECIFIC GRAVITY | 3.35 |
| SPECIFIC HEAT | 0.25 |
| PERMEABILITY c.g.s. units | 0.05 |
| COLD CRUSHING STRENGTH p.s.i. + 8,500 Kilos sq.cm. + 600 | |

| | |
|---|---|
| SPALLING INDEX (small prism test) | Cycles + 30 |
| PERMANENT LINEAR CHANGE 2 hrs. at 1,500°C. | Nil to 0.2% |
| WEIGHT PER CUBIC FOOT | 175 lbs. |
| WEIGHT PER CUBIC METRE | 2,700 kilos. |
| WEIGHT PER 1,000 BRICKS 9" x 4½" x 3" approx. | 11,700 lbs. |
| " | 5,320 kilos. |

Please contact our Technical Service Department for further particulars of these and other applications for G.R. '341' bricks.

*The GENEFAX GROUP for Everything in Refractories*

## GENERAL REFRACTORIES LTD

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## 0-4-0

*LIGHT*

**Weight:** 34 tons
**Drive:** Chain
**Horsepower:** 230 h.p.

*HEAVY*

**Weight:** 40 tons
**Drive:** Side rods
**Horsepower:** 310 h.p.

## 0-6-0

**Weight:** 48 tons
**Drive:** Side rods
**Horsepower:** 310 h.p.

## 0-8-0

**Weight:** 74 tons
**Drive:** Side rods
**Horsepower:** 620 h.p.

*STANDARD GAUGE 4' 8½" ALL OTHER GAUGES WILL BE AVAILABLE IN DUE COURSE*

**all Sentinel diesel locomotives are powered by Rolls-Royce engines and torque convertors** (TWIN DISC LICENCE)

*TRANSMISSIONS, CABS AND CONTROLS ARE STANDARD AND 230 OR 310 HORSEPOWER ENGINES ARE AVAILABLE*

**DORMAN LONG (STEEL) LTD are at present operating throughout their organisation over**

# 40

# Sentinel

## LOCOMOTIVES

**Sentinel locomotives are operated by:**

Associated Portland Cement Manufacturers Ltd.
Bass Ratcliffe & Gretton Ltd.
Dorman Long (Steel) Ltd.
Guest Keen & Nettlefolds Ltd.
Imperial Chemical Industries Ltd.
National Smelting Co. Ltd.
Richard Thomas and Baldwins Ltd.
Stavely Iron & Chemical Co. Ltd.
and others

*Aerial photograph of Dorman Long (Steel) Ltd., Lackenby Works, where a number of Sentinel locomotives are operating.*

Distributed in the British Isles by:
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**CONSETT IRON COMPANY LTD.**
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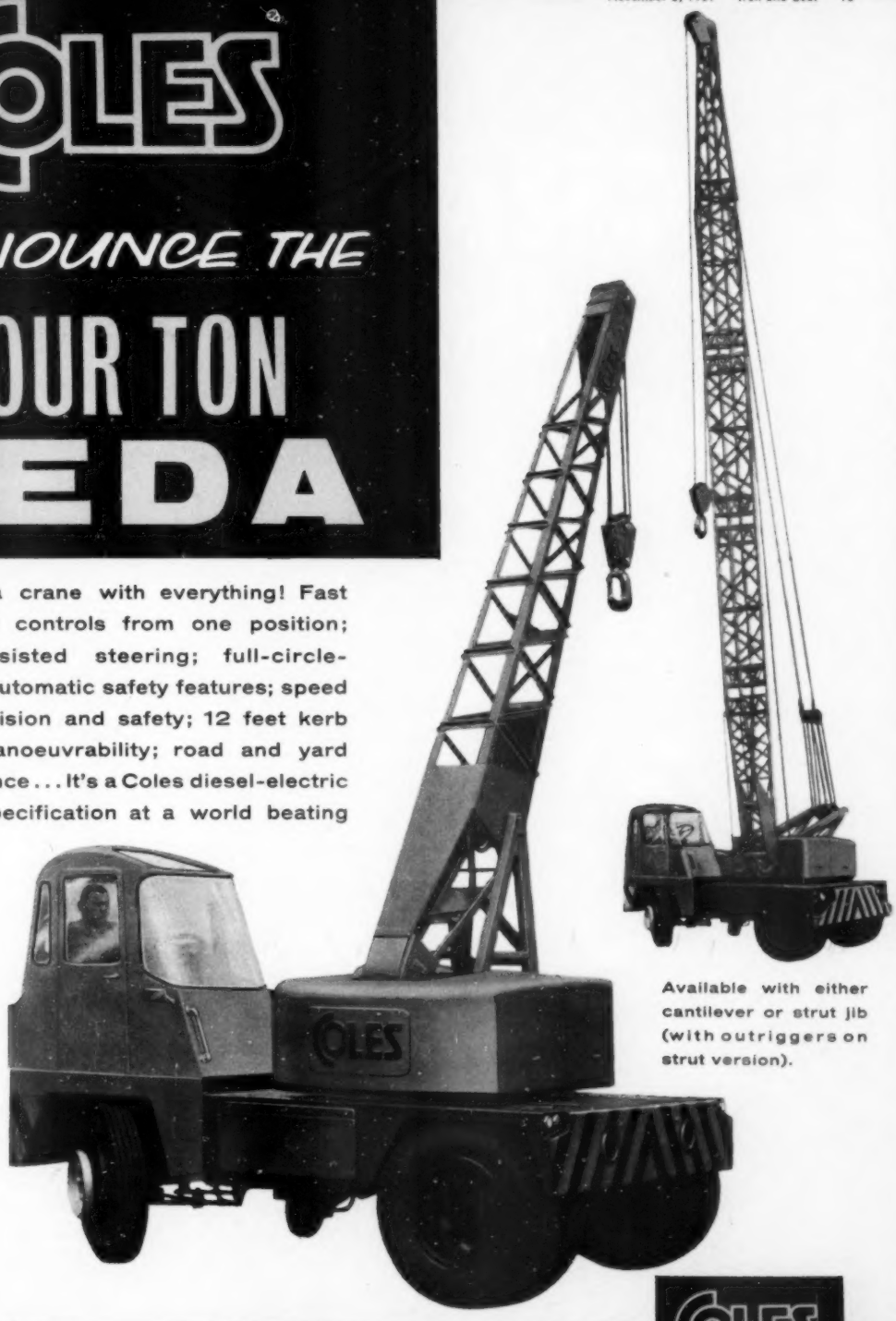
# FOUR TON LEDA

Here is a crane with everything! Fast travel; all controls from one position; power-assisted steering; full-circle-slewing; automatic safety features; speed with precision and safety; 12 feet kerb radius manoeuvrability; road and yard performance . . . It's a Coles diesel-electric quality specification at a world beating price!




Available with either cantilever or strut jib (with outriggers on strut version).

1032

Coles Cranes is a Registered Trade Mark

COLES CRANES

**STEELS ENGINEERING PRODUCTS LTD.**

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**THE NAME THAT CARRIES WEIGHT**

# CRAWLEY

## MINING EQUIPMENT

***Crawley thin seam mining equipment includes:—***

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
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MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS

*Write for* **CRAWLEY** *"Mining Equipment" Catalogue NOW!*

# THE CRAWLEY MIDGET MINER

**Operation**

1 As boring arms rotate coal passes from one arm to next until outer arm loads on to conveyor.
2 Peripheral side cutting chain clears the coal not loaded by trepanning arms and completes loading.

**Semi-Automatic Control**

Can be fitted with sensing device consisting of gamma ray source which automatically adjusts vertical height of machine depending upon the relative thickness of coal and rock between the source and the receiver due to preferential scattering by rock as compared with coal.

**Appreciation**

1 The first practical thin seam miner.
2 The first thin seam miner under semi-automatic control.

**A Low Seam Wide Buttock Loader For Seams 18 in. and upwards.**

**Performance**

1 Seams 18 in. to 30 in.
2 Depth of cut 4ft. 6in. to 4ft. 9in.
3 200 tons per shift in 2ft. 6in. seam actually achieved.

**Specifications**

1 Single-ended longwall cutting machine with four boring arms phased at an angle of 72° to each other.
2 Boring arms operated ahead of periphery chain clearing uncut and unloaded coal.
3 Chain includes flight picks bored to ensure complete coal loading.
4 Water jet dust suppression system.
5 Cutting height adjusted by fitting jib inserts.

**All Crawley Heavy Duty Machines have the following units standard and interchangeable:**

**DRIVE FRAME • GEAR BOX • GEAR ASSEMBLIES**
**EXTENSION SECTIONS • STRUCTURE • TAIL UNIT**
**CHAIN FLIGHTS**

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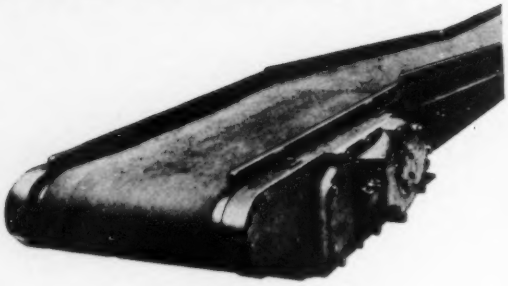
CRAWLEY

# WET or DRY



Conditions don't matter to B.J-D Neoprene lagged Face Belt Conveyors; wet or dry, they keep going.

Install B.J-D R/9/8s or 25F/Is and your confidence will be repayed by their reliability.

**R/9/8**

is the version of the R/9/1 with Neoprene lagged drums.
The electric motor is continuously rated at 15 h.p.

**Nests:** available separately with 4in dia. idlers for many widths of belts, from 5" - 44". Also adjustable Tracking Roller Nests, Self-Aligning Roller Nests and Impact Idler Nests.

**Idlers:** B.J-D Idlers are grease-sealed and precision-made to give well-nigh frictionless conveying.

**25F/1**

is the well-proved 25F with Neoprene lagged drums. The electric motor is continuously rated at 25 h.p.

BJD

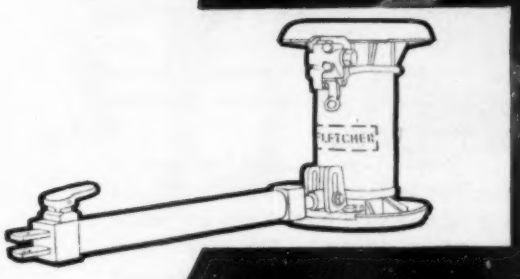
**Face Belt Conveyors With Neoprene Lagged Drums**

BRITISH JEFFREY-DIAMOND LTD., MINING DIVISION, WAKEFIELD, YORKS.

WF 5234

# FLETCHER DESFORD CHOCKS

*in action*




**Following successful installations in the East Midlands Division, the Fletcher Desford hydraulic chock has gained a reputation for reliability.**

50 and 100 ton versions: 6″ to 18″ stroke at 2″ intervals.

Fully approved by N.C.B —H.15 and H.11.

*Ancillary equipment by Fletcher includes:*

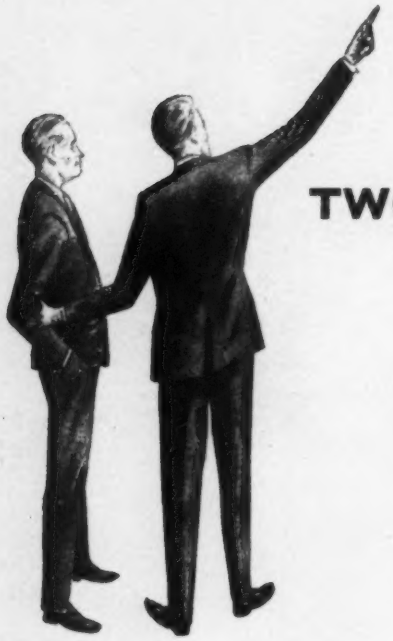
**double-acting hydraulic ram up to 2′-6″ stroke**

**detachable ram anchor brackets**

**extension pieces 6″ & 12″**

*Full technical information from*

**GEORGE FLETCHER & CO. LTD., Masson Works, Litchurch Lane, DERBY · Telephone: Derby 45817 · Telex 37514**



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**How Wharton service backed by years of experience can help you.**

From the moment of conception in planning craneage for a new plant, works, or the installation of a replacement crane the Wharton technical representative can be of invaluable service.

By carefully studying the problem with the customer, Wharton can incorporate his needs; at the same time using their experience to ensure equipment supplied gives complete satisfaction.

Whether your needs concern a 200-ton overhead electric crane or a light electric hoist it will pay you to call in Wharton. We have a head for cranes and lifting problems—and you can use it!

***This Catalogue describing Cranes and Hoists may be of help—if so write for it today.***

**THE WHARTON CRANE & HOIST CO. LTD.**
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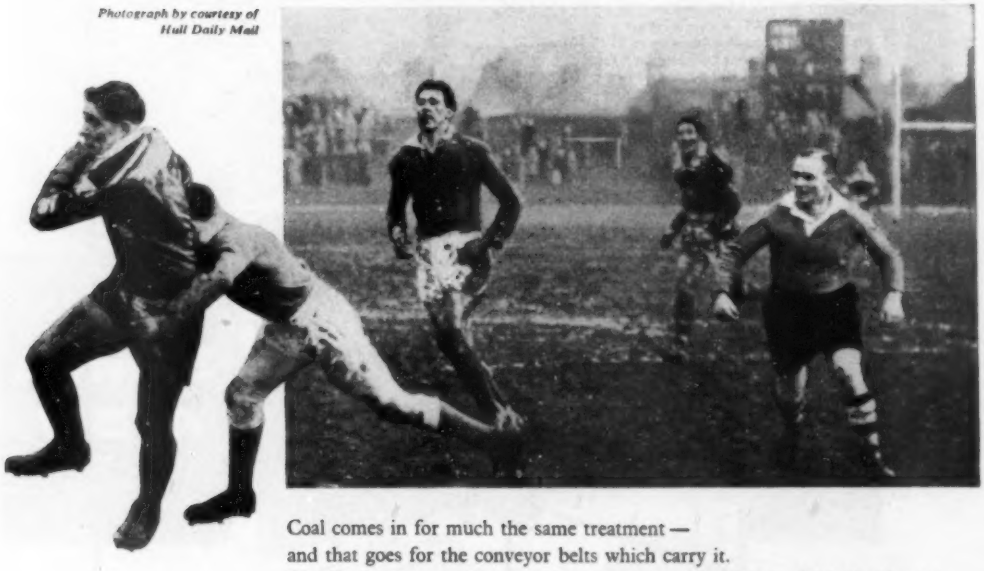
# ROUGH TOUGH HANDLING...

Rough, tough handling — that's the way they treat 'em in Rugby League.
There's no quarter given, and none asked,
but this does not deter stars like Great Britain's John Whiteley
from giving consistent, top-class performance.

*Photograph by courtesy of Hull Daily Mail*



Coal comes in for much the same treatment —
and that goes for the conveyor belts which carry it.
That's why the new Fenner Diamond range of belting has been developed:
to stand up to the never-ending scrimmages of colliery life:
to maintain vital handling movements and to score
production points even under the wettest conditions.

# Fenaplast

DIAMOND TYPE COLLIERY CONVEYOR BELTING

A PRODUCT OF

**J. H. FENNER & CO. LTD. HULL**

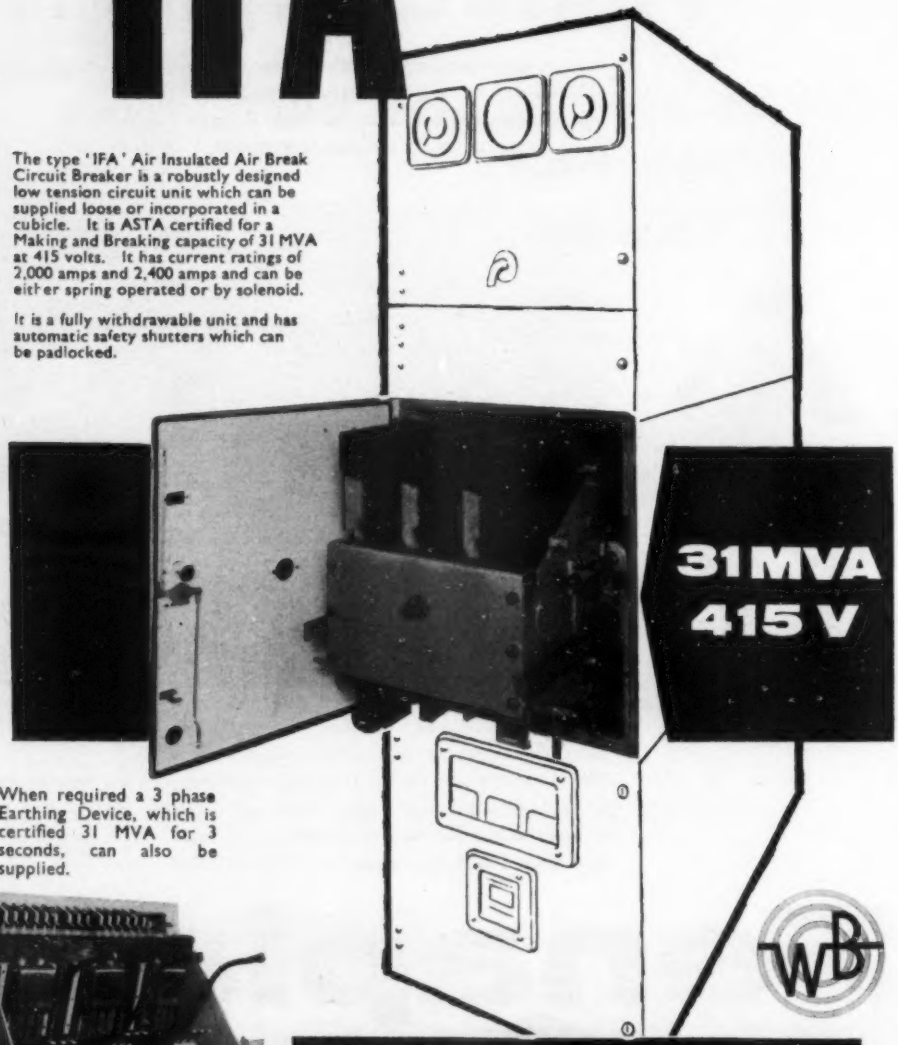
L'ARGEST MAKERS OF V-BELT DRIVES IN THE COMMONWEALTH

*FACTORIES OVERSEAS IN AUSTRALIA, INDIA AND SOUTH AFRICA*

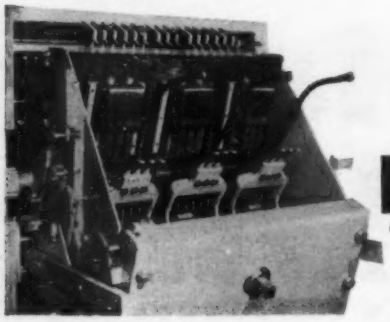
# TYPE IFA AIR BREAK SWITCHGEAR

The type 'IFA' Air Insulated Air Break Circuit Breaker is a robustly designed low tension circuit unit which can be supplied loose or incorporated in a cubicle. It is ASTA certified for a Making and Breaking capacity of 31 MVA at 415 volts. It has current ratings of 2,000 amps and 2,400 amps and can be either spring operated or by solenoid.

It is a fully withdrawable unit and has automatic safety shutters which can be padlocked.




When required a 3 phase Earthing Device, which is certified 31 MVA for 3 seconds, can also be supplied.



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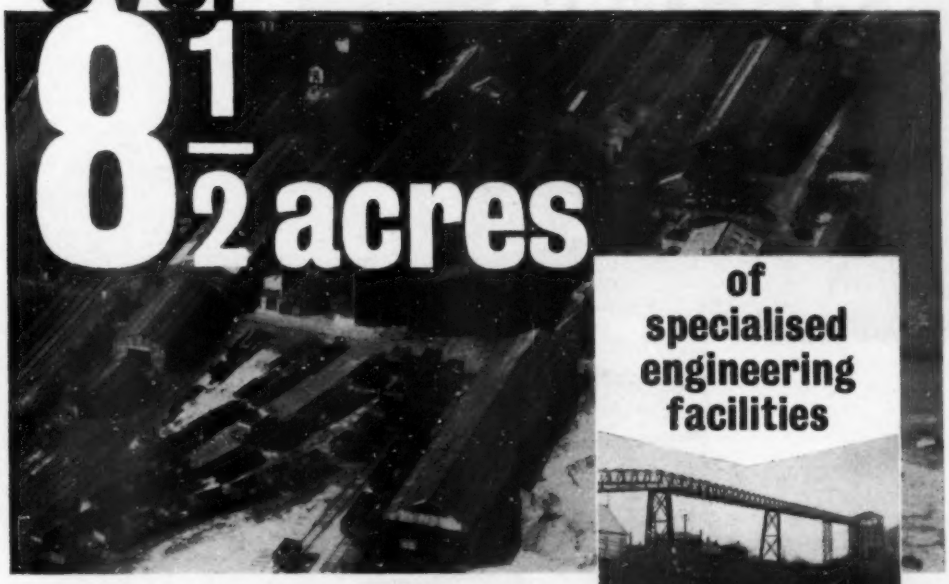
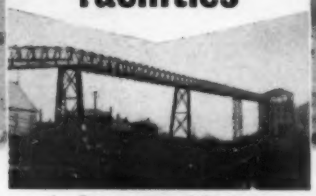


## of specialised engineering facilities



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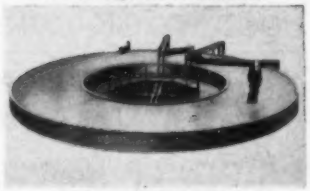

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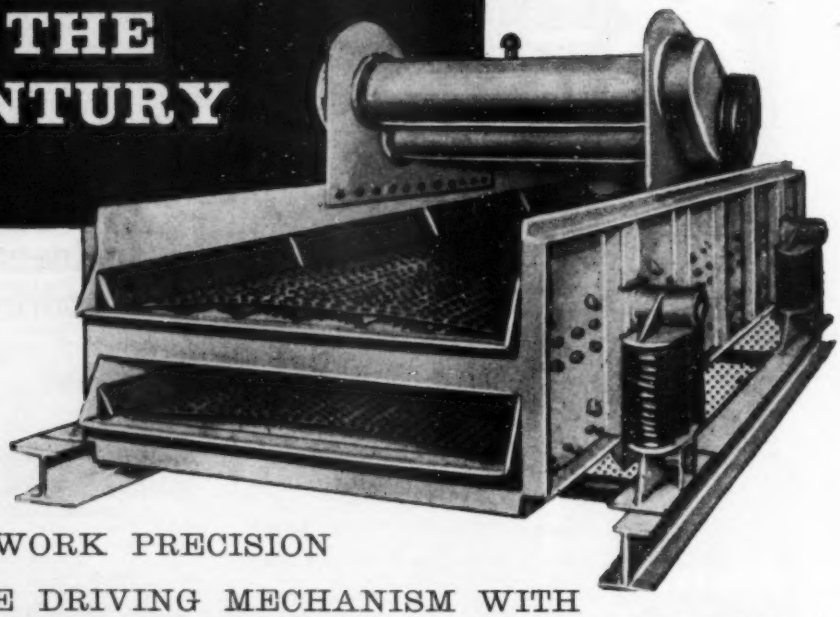

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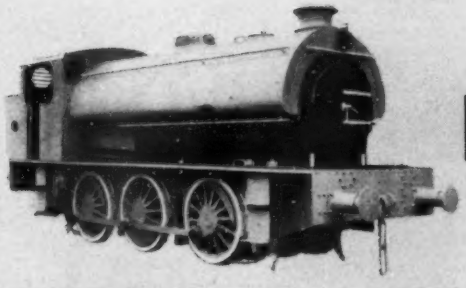

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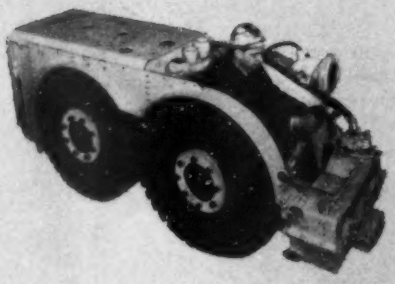
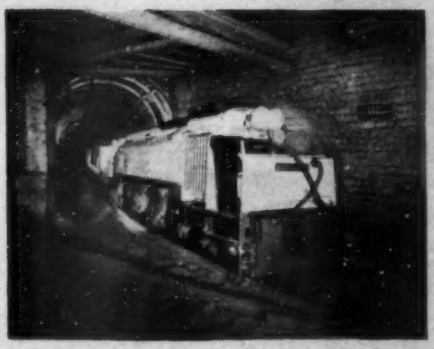
"Austerity" locomotives are now being offered with the latest underfeed firing equipment. In addition to building new 'Austerities' 'Hunslet' has organised a Repair Scheme specially for the Austerity Locomotive and being the designers can offer the most economic prices. A large stock of spares makes for a speedy return to service.



**HUNSLET** *MINES TRACTOR*

The MT.25 Flameproof Mines Tractor is robust, self-contained, and does not require rails or a specially prepared roadway. It can operate where high coal dust and methane contents in the atmosphere may be encountered. The basic unit is equipped with a hydraulic pump and the frame is drilled to receive ancillary equipment, for example:—Angle Dozer, Shovel Loader, Fork Lift, Winch and Trailers, etc.



**HUNSLET** *DOUBLE ENDED MINES LOCOMOTIVE*

The Hunslet flameproof diesel range covers from 23 to 100 h.p. and includes units with single or double-ended driving positions. Electric trolley or battery locomotives with differential drive can also be supplied.

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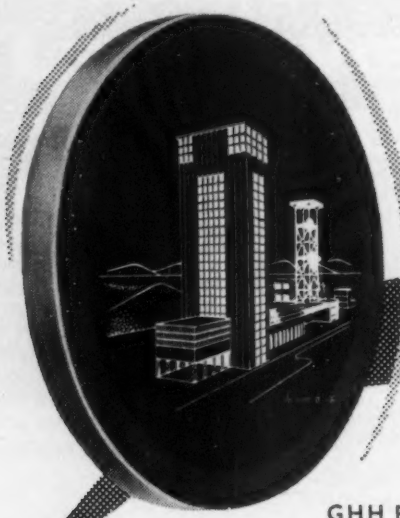

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complete installations,
shaft winding, mine car handling,
conveyors and loading points,
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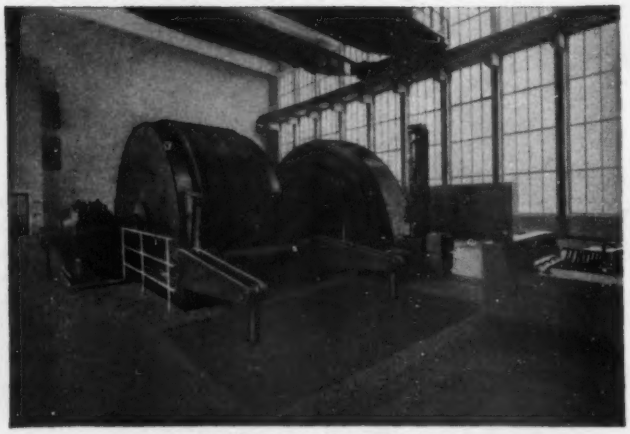
shaft construction.



*GHH D.C. Four Rope Tower Winder*

*Koepe pulley 5·4 m ø* *useful load 25·2 t.*
*winding speed 16 m/s* *depth 1200 m*

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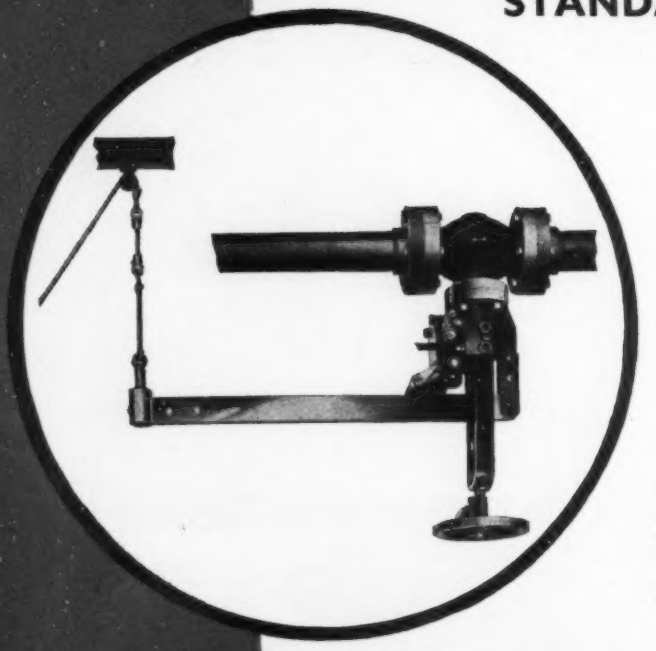
Complete water barrier for fifty yards on 2 in. dia. pipe, with additional leads to the underside of the conveyor belt with 1 in. dia. pipe.



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2. **SOUNDING OF ALARM**
3. **SETTING UP OF WATER BARRIER**

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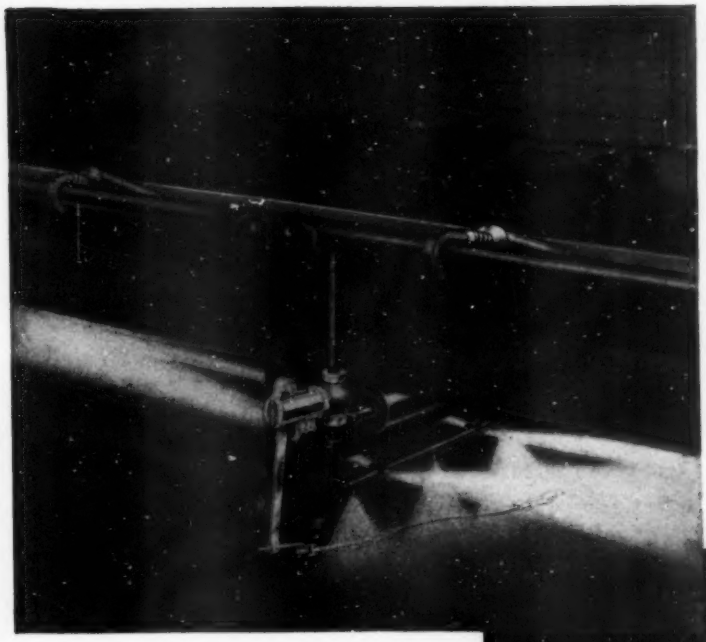
# MINOR AUTOMATIC THERMAL VALVE

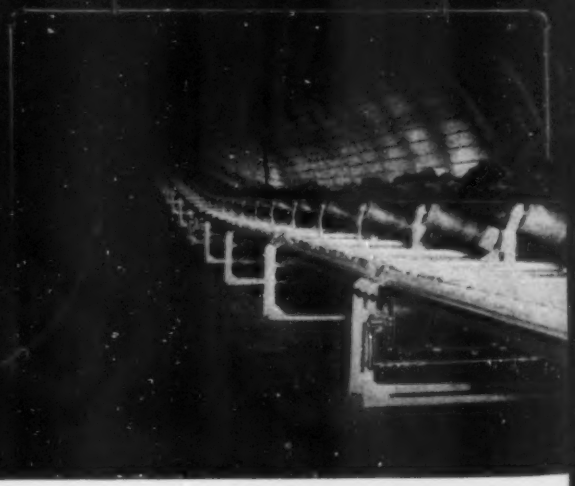
## FOR RUN OF CONVEYOR PROTECTION . . .



Photograph shows MINOR THERMAL VALVE fitted to MECO tubular structure incorporating high pressure water main.

Photograph by permission of the Mining Engineering Co. Ltd. and N.C.B. - N.W. DIV. E. LANCS. AREA.

Photograph shows MINOR THERMAL VALVE installation using standard high pressure main.



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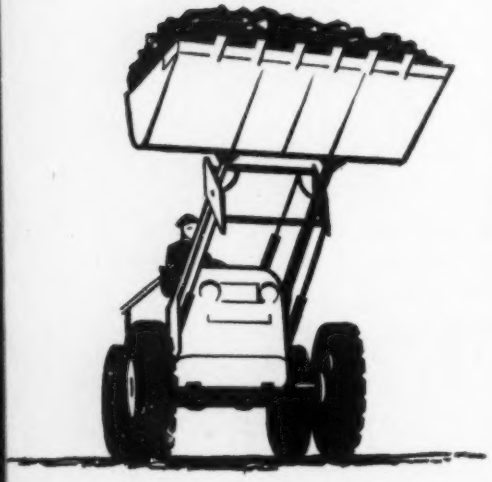
# The place

## COAL HANDLING WITH THE **CASE W12** AT



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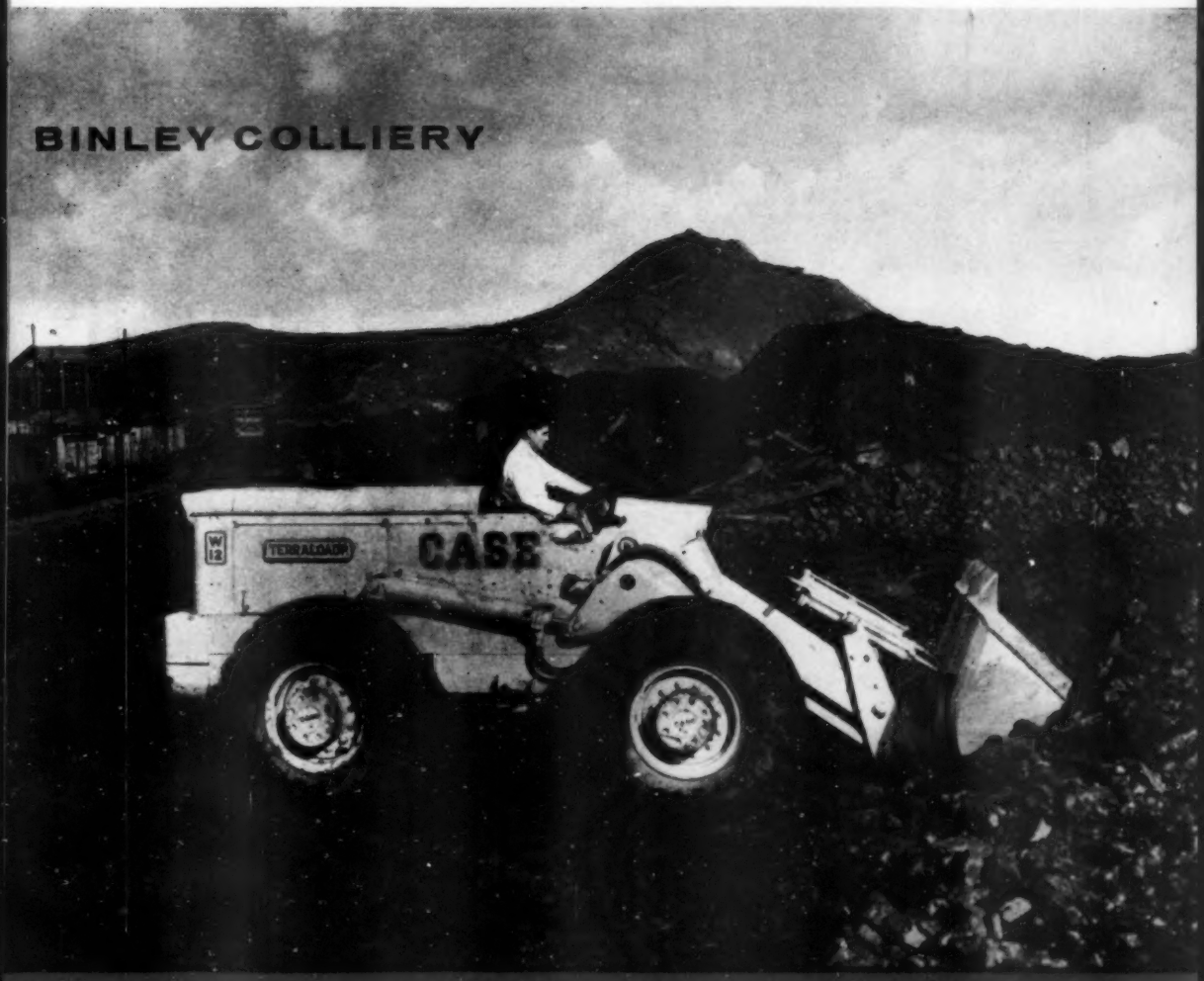
| LIFT AT 0 MPH | 15,000 LB | 11,000 LB | 4,500 LB |
| CARRY AT 4 MPH | 9,000 LB | 5,500 LB | 3,000 LB |
| BREAKOUT FORCE | 23,500 LB | 13,500 LB | 7,800 LB |
| MAX. SPEED MPH | 24 | 23 | 23 |
| FORWARD REACH (to tyres) | 6 FT 3½ IN | 5 FT 2½ IN | 3 FT 0 IN |

# for CASE

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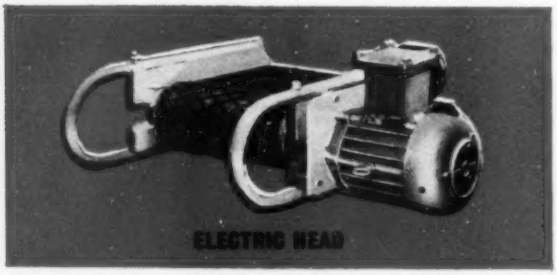
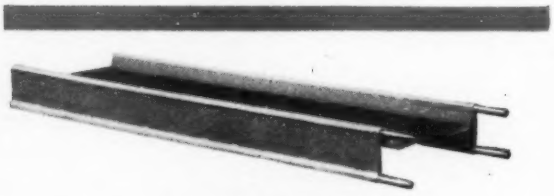
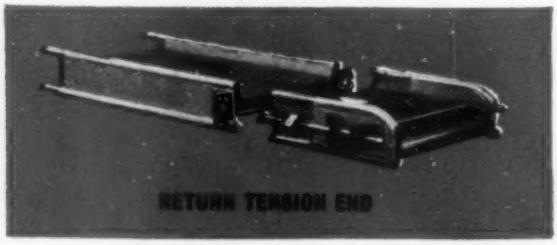


ELECTRIC HEAD

TAPERED SECTION



PARALLEL SECTION



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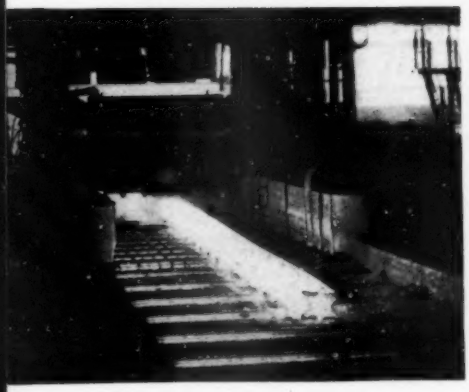

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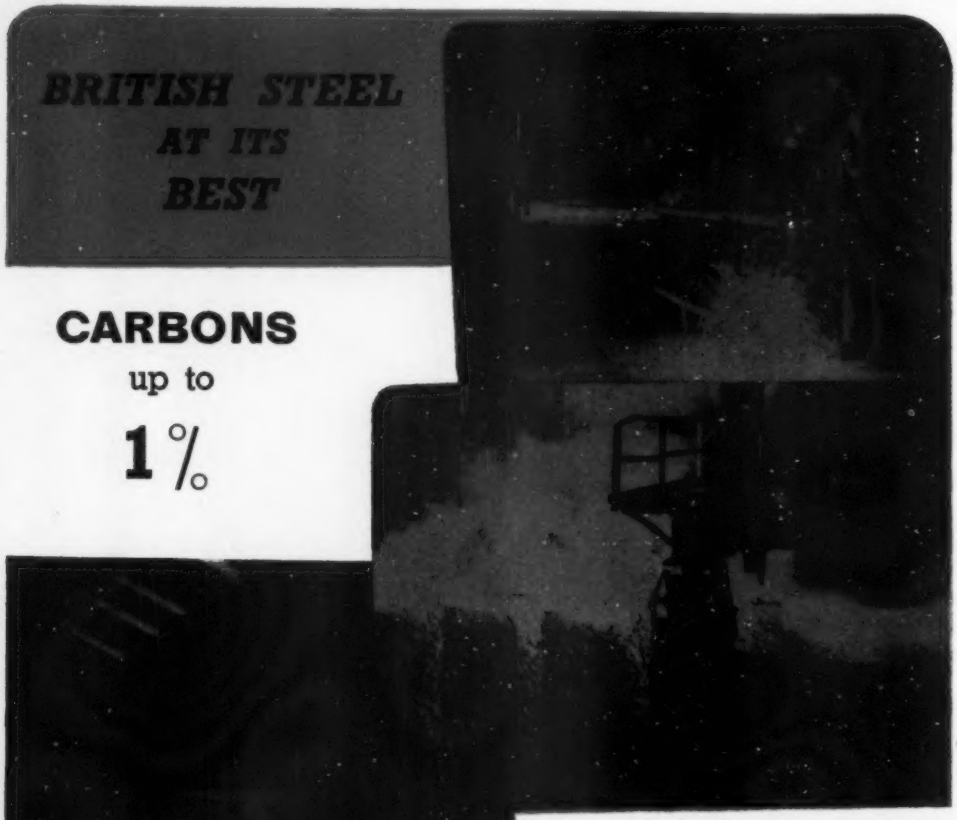

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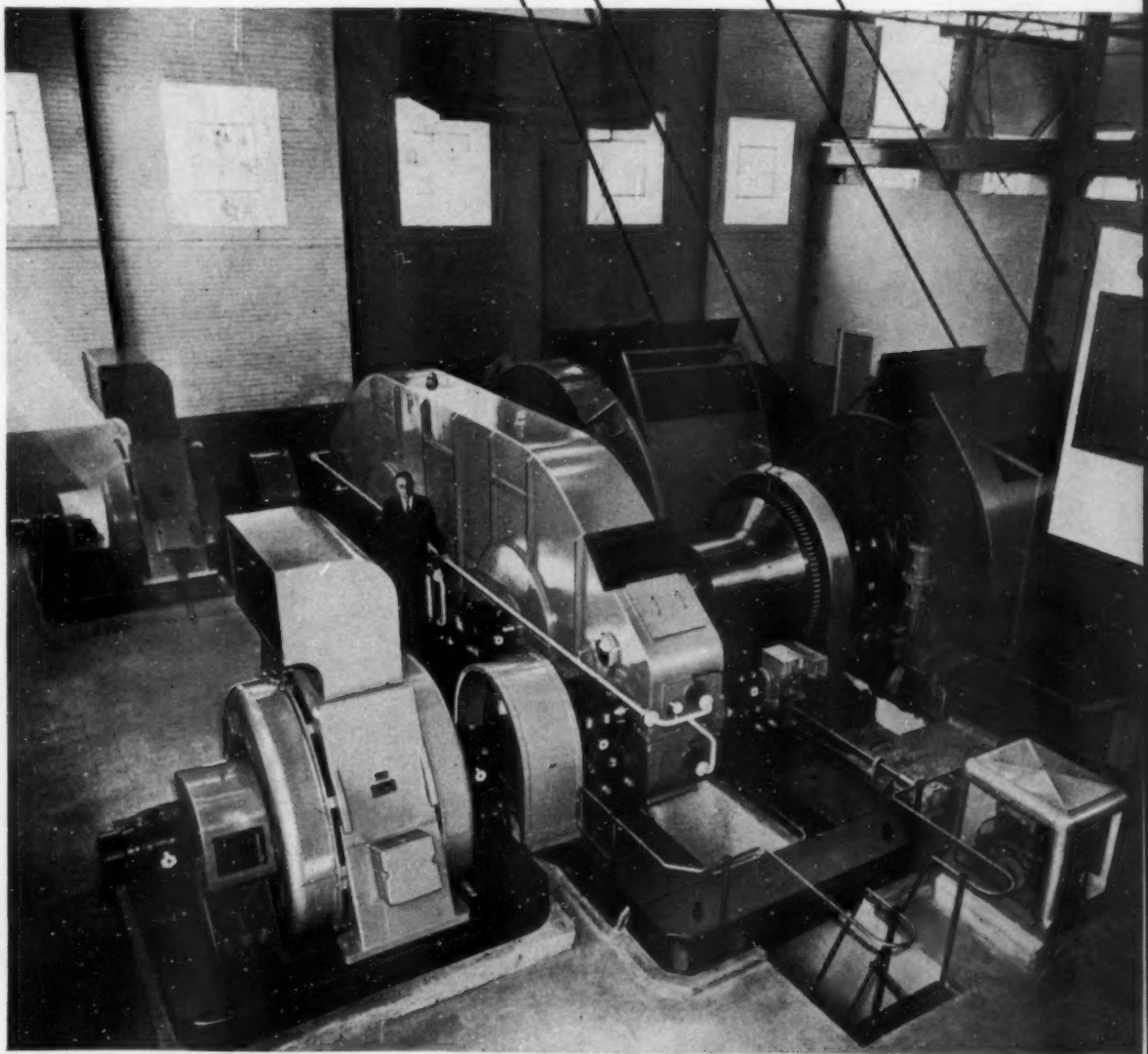

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# Meco DRIFT & TRUNK Conveyors

The top illustration shows a Meco power pack rated at 45,000 ft. lbs. used as a single drive for a double drum belt conveyor driving head. The conveyor is 2,146 ft. long with a lift of 478 ft. and carries 2,000 tons/day run-of-mine coal. The H.P. rating is 300 at 400 ft./min.

MECO STANDARD POWER PACKS, SINGLY OR IN COMBINATION, CAN BE BUILT UP TO THE MAXIMUM POWER OF ANY AVAILABLE HIGH DUTY CONVEYOR BELTING.

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Another

# Wellman

## Complete Steelworks Installation

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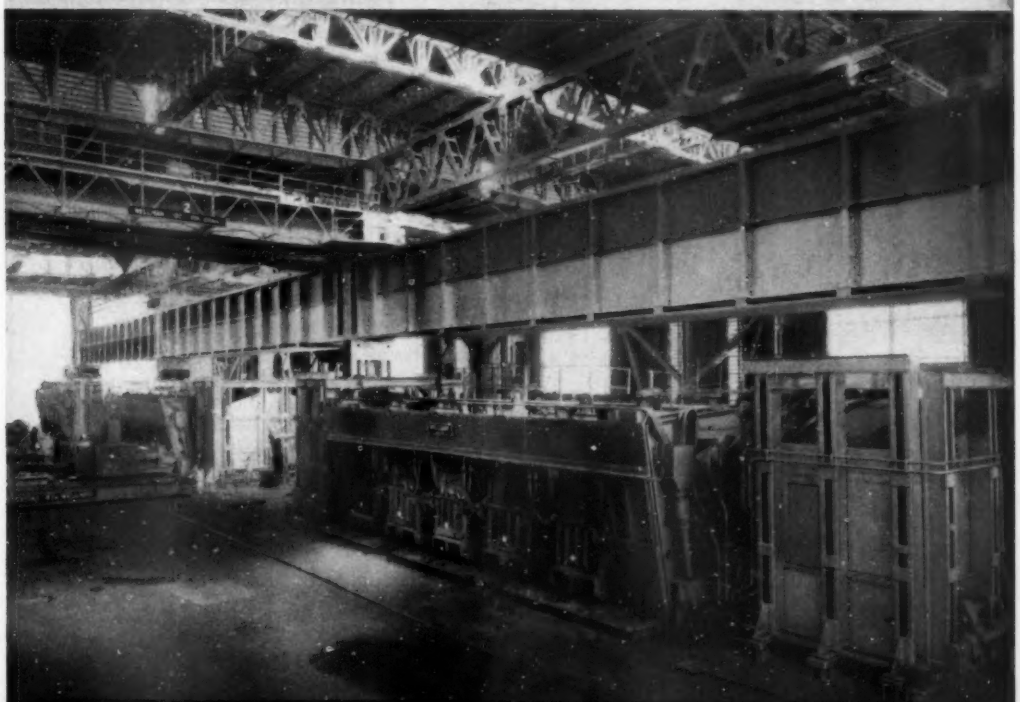
This modern steelworks which marks an important step in the expansion of the Spanish Steel Industry includes: three 350-ton Open Hearth Tilting Furnaces, one 600-ton Active-type Metal Mixer, two 100-ton Hot Metal Cranes, two 4-ton Ground-type Revolving Open Hearth Furnace Chargers, two 140-ton Ladle Cranes, etc., etc.

Further orders have been received from these clients for Wellman Soaking Pits, Reheating Furnaces, Charging Machines, etc.



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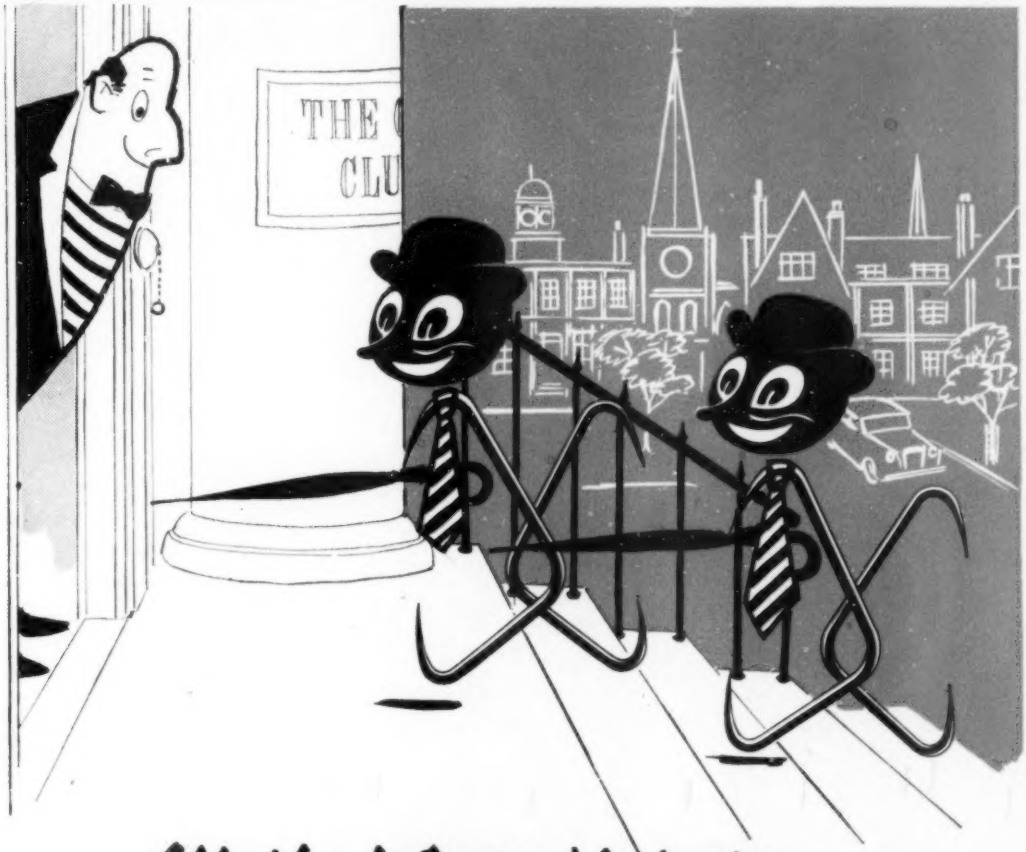


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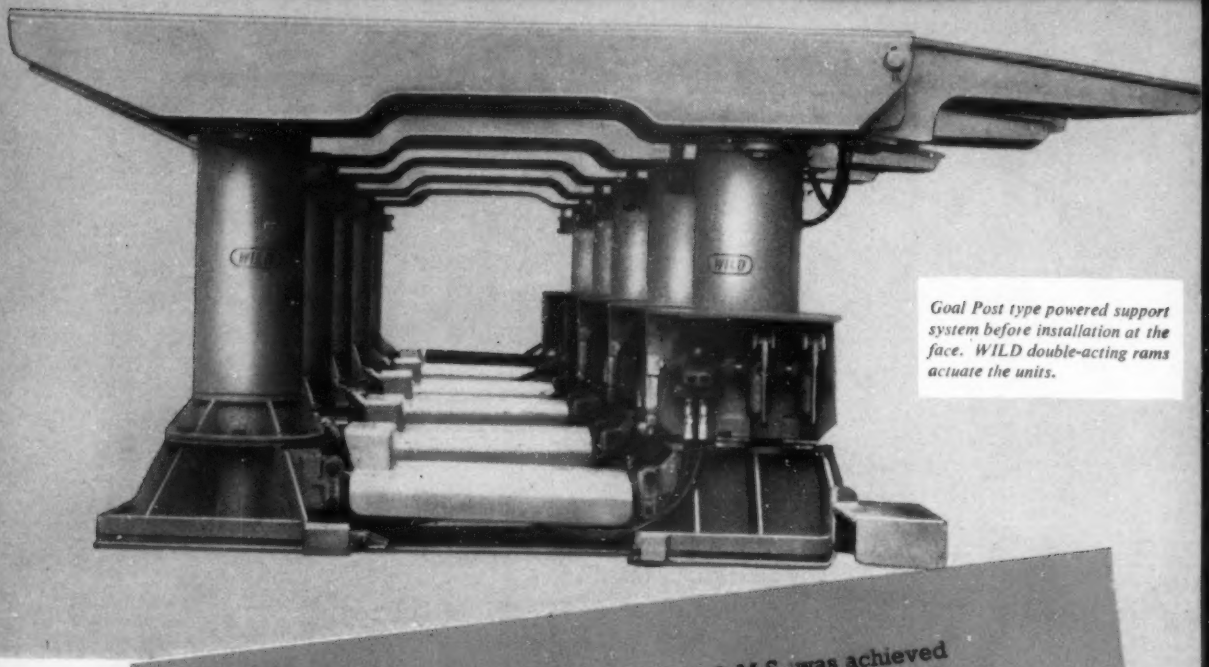

*Goal Post type powered support system before installation at the face. WILD double-acting rams actuate the units.*

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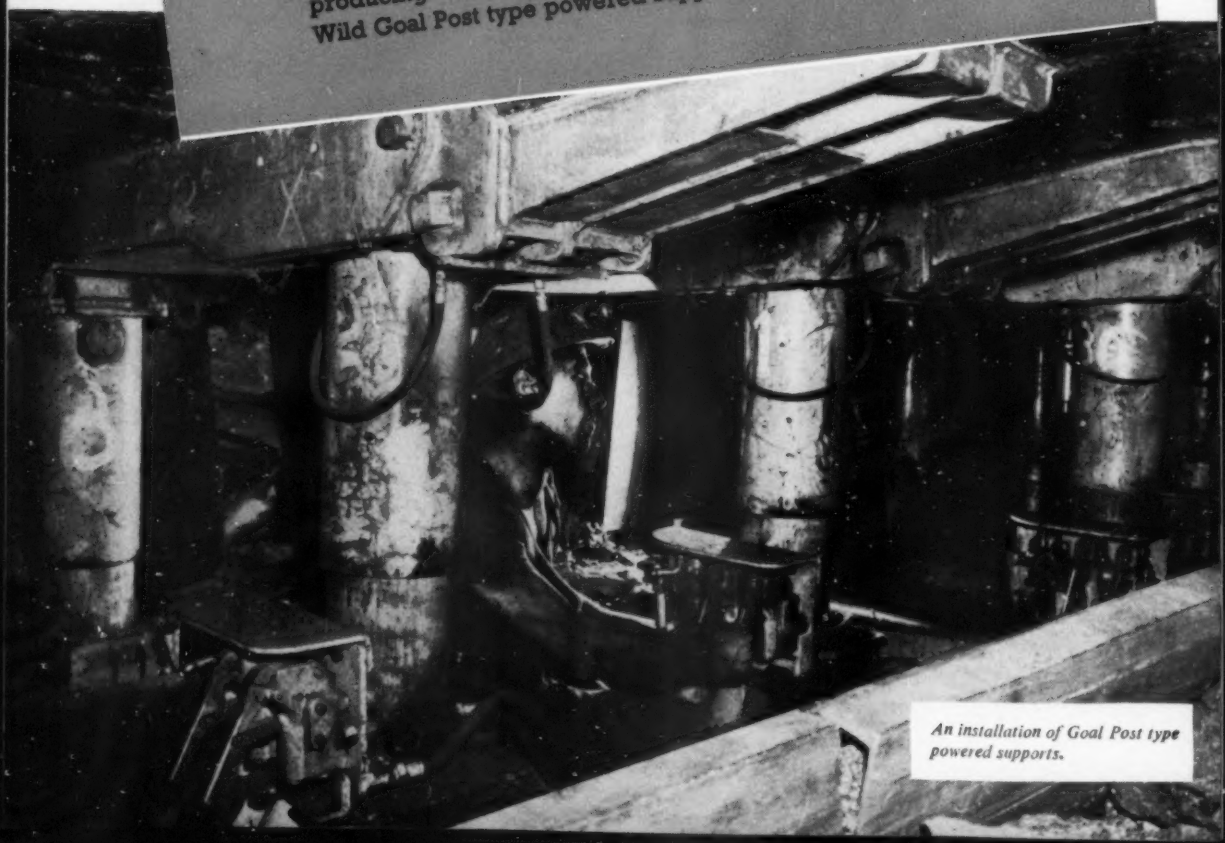

*An installation of Goal Post type powered supports.*

# SUPPORT SYSTEM

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**Top:** *50 ton thin seam Desford Chock*
**Centre:** *100 ton Desford Chock with pedestal.*
**Bottom:** *100 ton Desford Chock with ratchet extension and ram.*

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A title worn for ninety-five years is not lightly to be cast aside, and, in this climate of change, let us first look at what is unchanged, steadfast, immutable. Such is our proven loyalty to coal and those who win it; COAL has spelt out its worth and its achievements on our cover—as through all our pages—for a near-century, and we are justly proud of our intimacy with a brave and virile industry. Whatever else may change, we speak for coal.

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In tune with these shifts of stress we plan many a change in presentation. A larger page has been long requested and recommended by those who purchase advertising space and those who design material to fill it; we are glad to be able to fulfil our own plans and their wishes simultaneously. In the interests of the busy executive we are radically restyling the layout and type of the journal; numerous innovations will be aimed at making features more rapidly located, data more easily assimilated, indexing more complete. The standard of presentation of STEEL & COAL will be as high as that of any specialist journal in the world.

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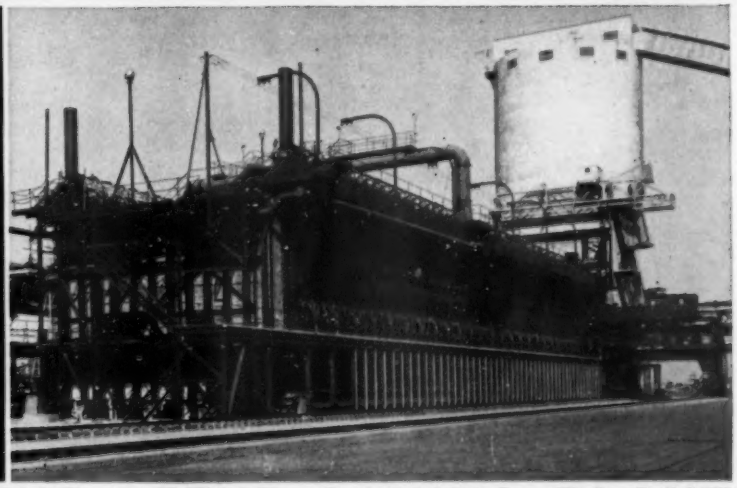

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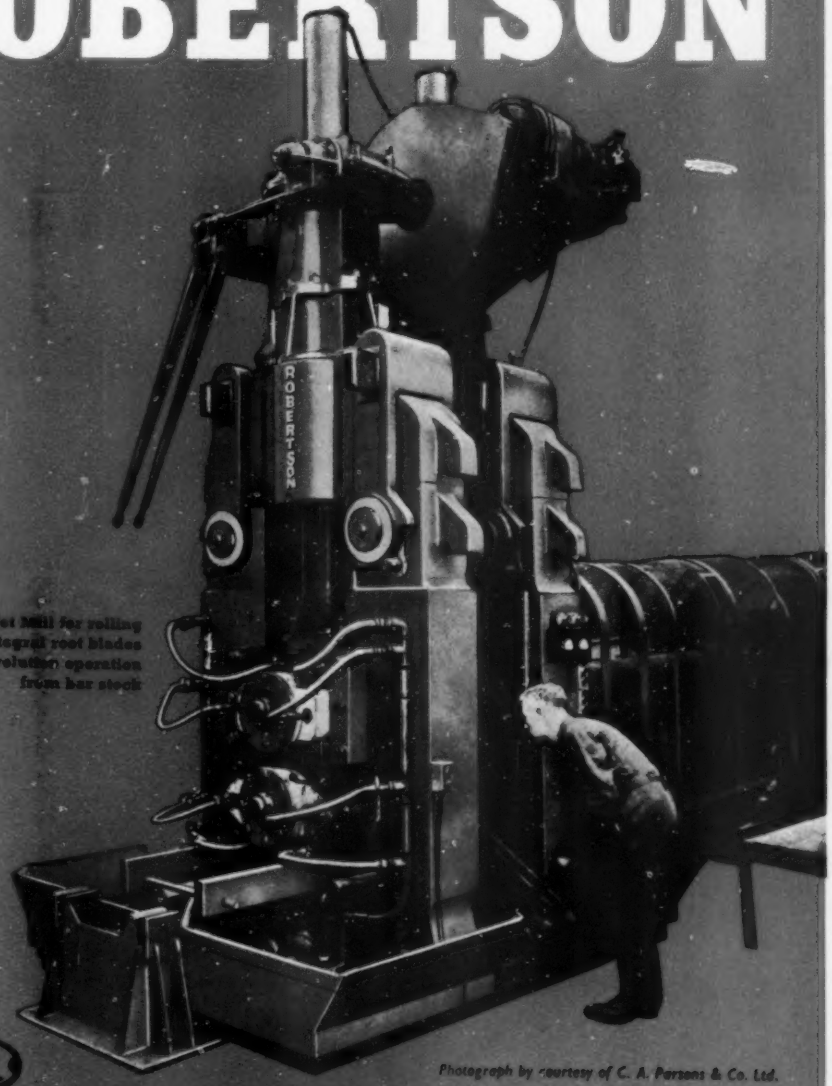


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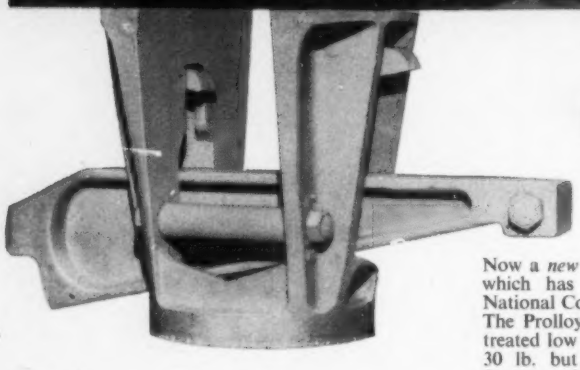

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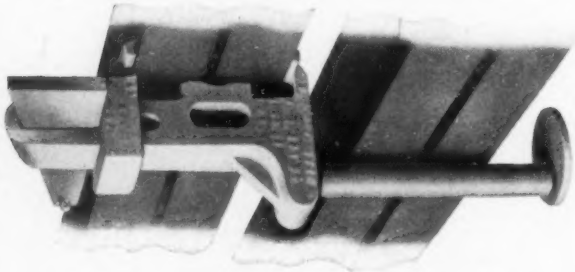

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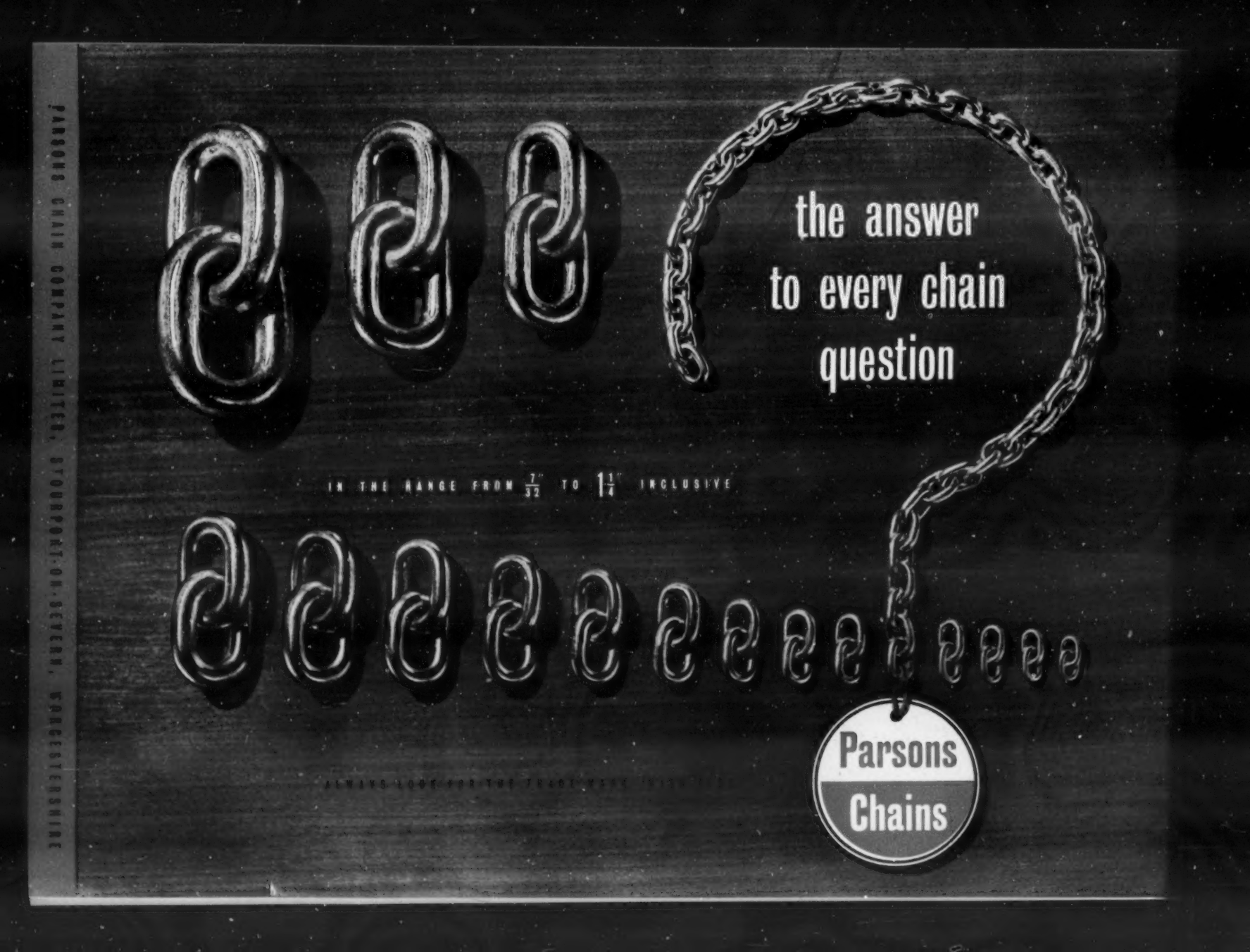
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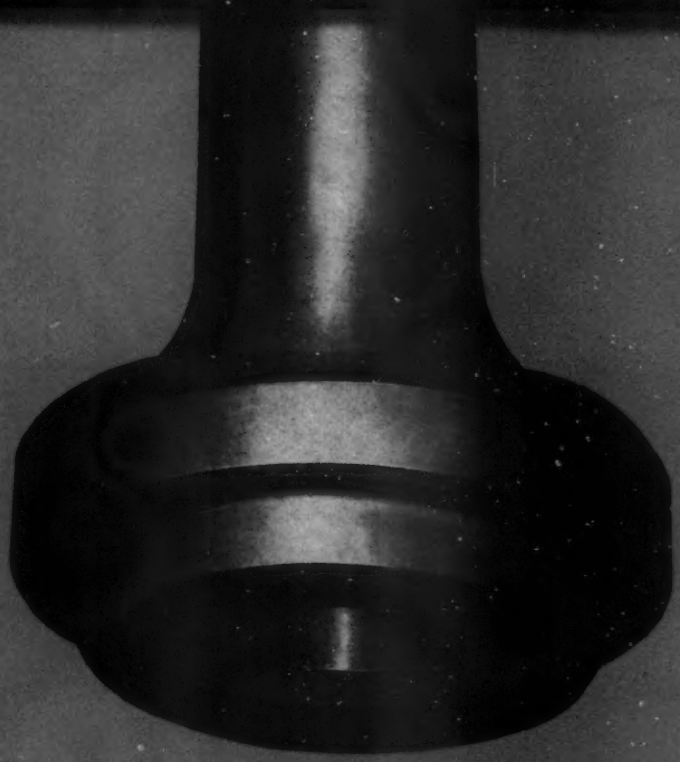

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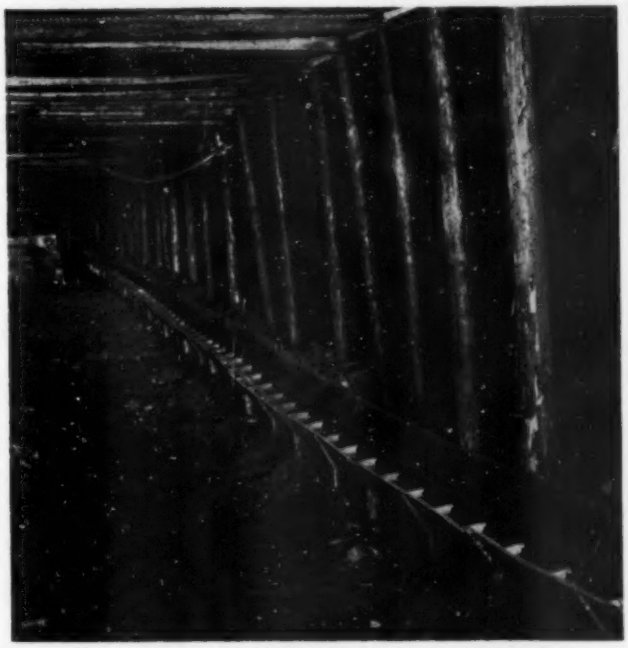

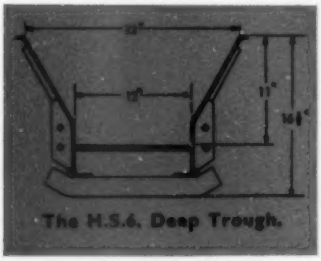

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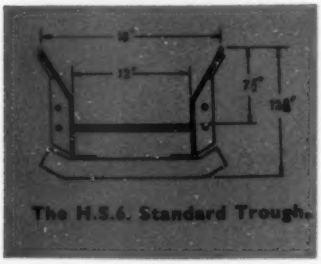

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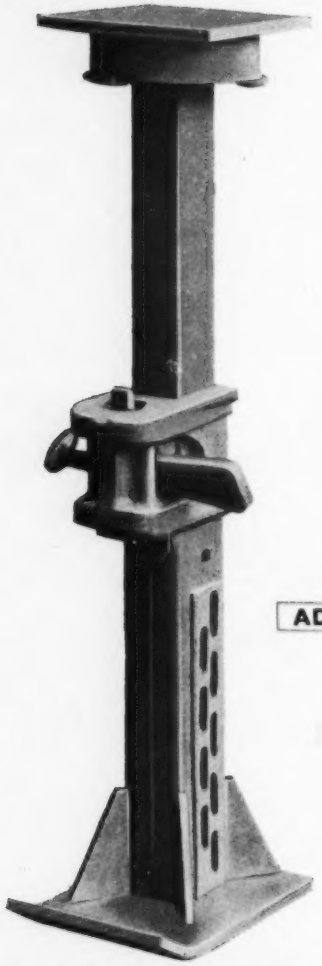

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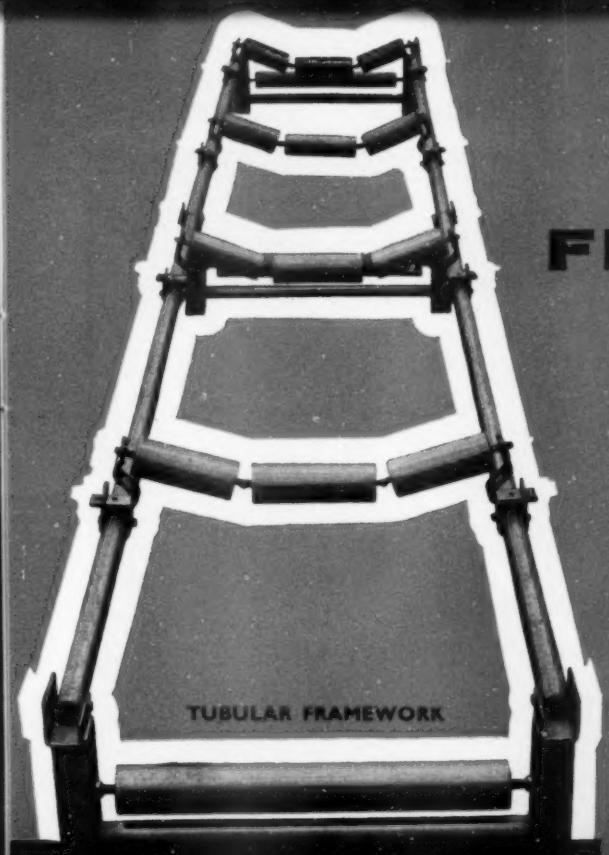


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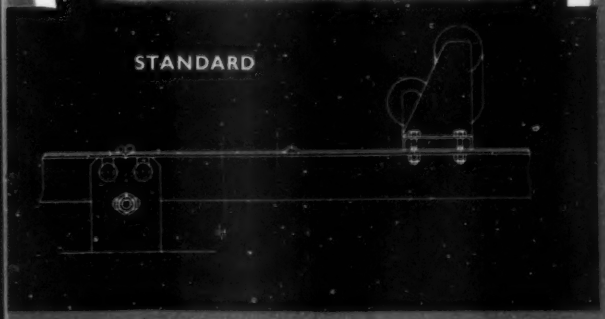


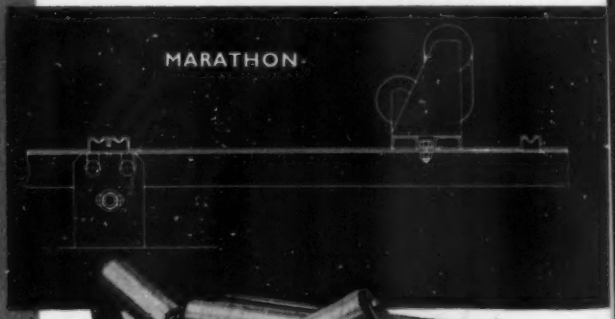

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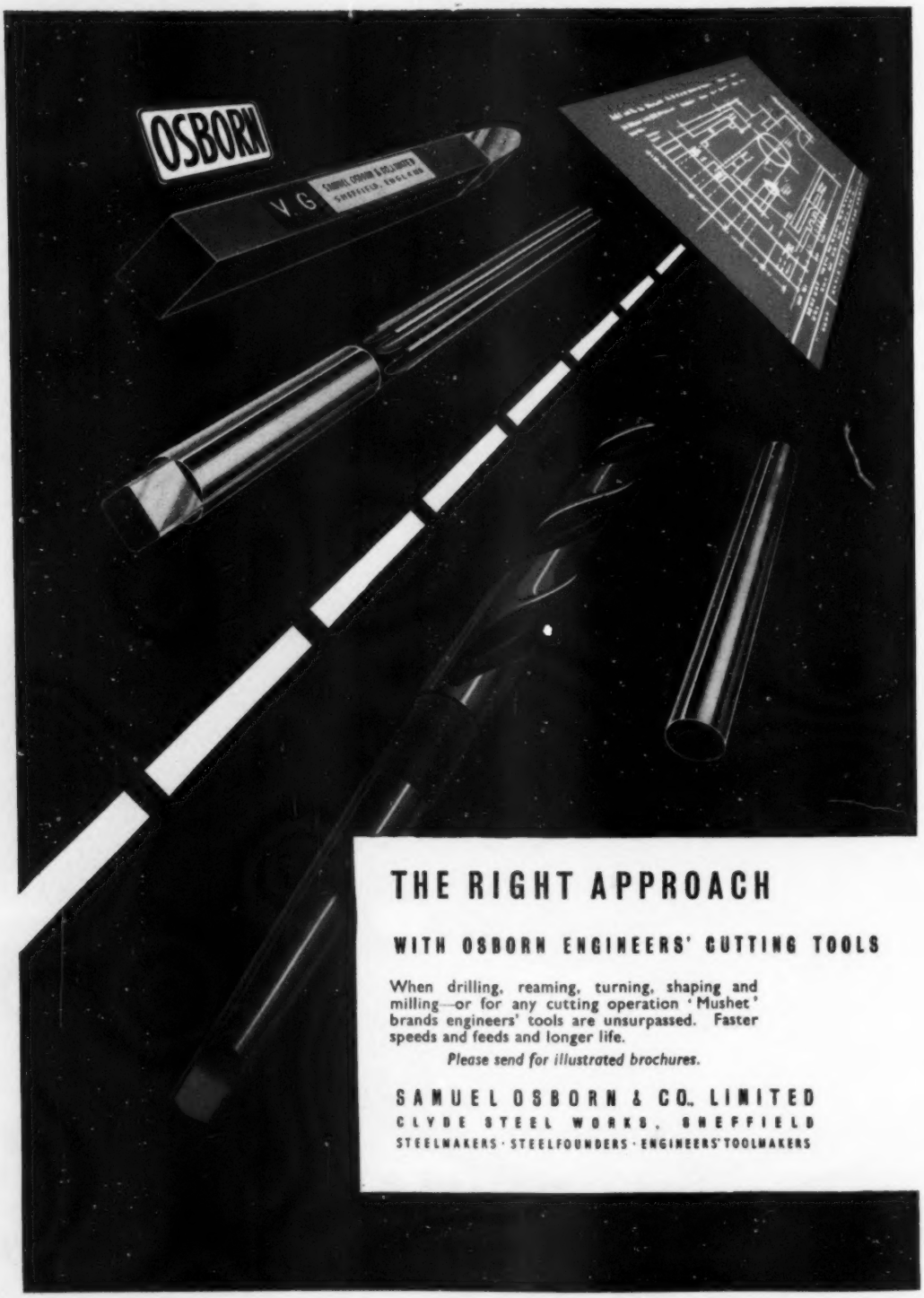


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# IRON & COAL

THE IRON AND COAL TRADES' REVIEW

NOVEMBER 3, 1961

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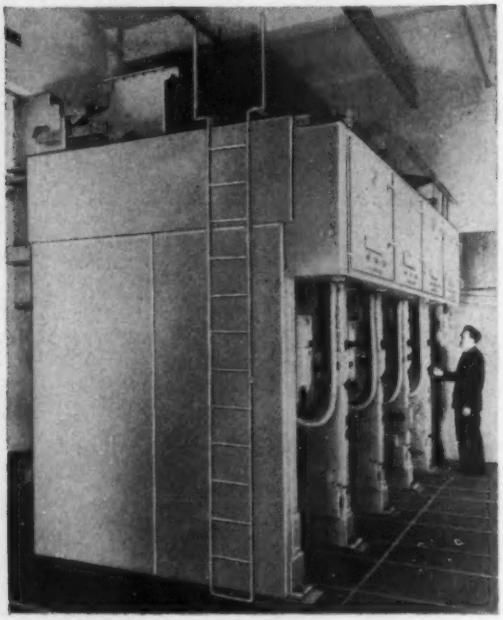

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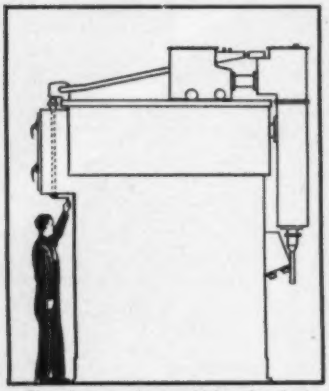

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Vol. 183 November 3, 1961 No. 4,868

# The Truck Acts

THERE was a time—and not very long ago—when the Truck Acts meant rather more to the average worker than they do today. These products of early 19th century legislation—typical in their reflection of the industrial conditions of their time—have for many decades been quoted as minor victories in educational warfare against the Industrial Revolution. Today, if the display of general knowledge by not only schoolchildren, but adults on television and radio, is anything to go by, the Truck Acts convey little or nothing to the man or woman in the street. They could quite easily be forgiven for assuming that the legislation was concerned with road transport.

But the requirements of the Acts still apply, and it was because the Acts are typical examples of somewhat creaking and anachronistic legisation that Mr. Iain Macleod, then Minister of Labour, set up a committee to report on the Acts in July, 1959. That committee has now presented its report, and it is somewhat surprising to learn that in the 11 years from 1947 to 1958 no fewer than 123 cases were brought under the Truck Acts.

For the benefit of those who recall (and perhaps dodged) a question in their GCE paper on the subject, theTruck Acts, the first of which dates from 1831, were designed to protect workers from the unscrupulousness of employers at a time when the working man was too weak and unorganized to stand up for himself. They set out to curb such abuses as part-payment of wages in the form of shoddy goods, and any restrictions on the ways in which wages should be spent—practices which were most prevalent in the industrial Midlands and the North. It would be a foolhardy employer who, today, had the temerity to introduce such practices with any hope of getting away with it for more than a week or two.

Nevertheless, protection by process of law is still necessary; the 123 cases before the courts are witness of that. Present economic circumstances may not warrant extensive legislation, but economic circumstances can change almost overnight and practices be adopted that, without covering legislation, might be difficult to suppress or eradicate.

Few will quarrel with the committee's recommendation that the Truck Acts as they now stand should be repealed and replaced by up-to-date legislation. Guidance for the employer and protection for the worker is still needed, but as the Acts now stand it is almost impossible to know exactly what they do forbid. May luncheon vouchers be considered a part of wages paid; are private contributory pension schemes, transport to and from work, loans, or even regular deductions towards National Savings permissible deductions in whole or in part from wages? Even up to last year it was illegal—because of the Truck Acts—to pay wages by cheque, even if the unanimous consent of the people concerned had been obtained.

It therefore seems reasonable that revised legislation should concern itself with deductions from wages and that, if the worker agrees to any such deductions, it should be made manifest that it complies with existing legislation and that whatever agreement is reached is not reached under duress, either direct or implied.

That is the finding of the committee and it would seem just and reasonable. In any case, the committee has expressed the view that the worker should have the right to appeal to a local tribunal, made up of an employers' and a workers' representative with an independent chairman, which should be free to make binding awards and to allow costs to workers in respect of the expenses incurred and any earnings lost through an appeal.

Where an industry is highly organized so far as its workers are concerned the setting up of such a tribunal could add just one more to an already large number of consultative and negotiating committees and councils. Here, probably, the necessary protection might be afforded by a sub-committee of an existing representative body. The workers the Committee of Inquiry probably had in mind are the 3,000,000 to 4,000,000 who are not protected by collective bargaining agreements or statutory wage-fixing machinery, and who still negotiate individually with their employers. It is this section of the labour force that needs some measure of protection.

Because the suggested new legislation would cover a much larger number of workers, some amendment would be called for in the Payments of Wages Act, which, since last year, has enabled wages to be paid into a bank account, or by postal or money order. At the moment it covers only certain types of manual workers.

Whatever is done, it would generally be agreed that any employer wishing to provide his employees with benefits over and above their cash wages should be allowed to do so without fear of having the worst of 19th century motives imputed to him. With that there can be nothing but agreement—just so long as such benefits do not restrict the workers' freedom of mind and movement.

# *Passing Thoughts . . .*

ONE of the most important subjects with which I am called upon to deal is the relative failure of British industry to make use of science and the scientist. . . . The broad truth is that, outside a few main industries, far too few scientists are employed, and if more were employed, some directors might not—in their present frame of mind, know what use to make of them.—LORD HAILSHAM, Minister for Science.

*We hear a lot today about strikes from silly causes and we tend to condemn without a thought. There are undoubtedly agitators, who look for reason for trouble, and then get a good opportunity to lead men who are disgruntled by monotony through a failure by management to give them an interest and a feeling of being needed and vital to an enterprise.*—MR. CECIL HURST, *deputy chairman of Samuel Osborn & Company, Limited.*

By switching the emphasis of pay policy away from the doctrine of fair wages for inflation towards the proper economic doctrines of what the country can afford and where inflows of labour are most needed, a reform . . . could transform the whole prospect for future British economic expansion.—The Economist.

*Too much should not be expected too quickly from the larger trading areas [of the Common Market]. Even when tariffs have disappeared and fiscal policies have been suitably related there is no reason to believe that problems of production and distribution will disperse in a spirit of economic unanimity.*—MR. S. R. HOGG, *chairman of Williams & Williams, Limited, makers of metal windows and doors, etc., of Chester.*

I look forward to the time when the benefits of clean air can be enjoyed by all the mining areas. I should like to see people clamouring for cleaner air . . . it seems to me that the air in those districts where men are employed long hours underground away from sunshine, should be every bit as pure and free from pollution as elsewhere in the land.—MR. JOHN F. H. WALTON, public health inspector, Bolsover (Derbyshire).

*Let us hope, now that Government are themselves heavily in the steel business, that they will lose some of their distrust of profits and realize that in an industrial society of whatever tint profits are a wholly legitimate and in fact essential source of savings and investment and therefore of economic growth.*—MR. J. R. D. TATA, *chairman of the Tata Iron & Steel Company, Limited, India, in his annual statement to shareholders.*

We may have to pull our socks up somewhere to meet competition and there may be some casualties. We have to face the fact that we can't afford to have any slackness in our efforts, but those people who talk about working harder in the physical sense are talking a lot of nonsense.—Mr. W. J. CARRON, president of the Amalgamated Engineering Union, referring to Britain's entry into the Common Market.

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NEW AGENTS for India and Yugoslavia have been appointed by the Tempered Spring Company, Limited, a member of Tempered Group, Limited, Sheffield. In India, the New India Equipment Company Private, Limited, Delhi, will represent the firm's interest exclusively to the agricultural industry, and in Yugoslavia the new agents are "Intercommerce" General Trade Agency, Belgrade.

# North-Eastern NCB's Second Information Centre

SECOND information centre and showrooms set up by the North-Eastern Divisional Coal Board in its drive to promote the use of solid fuel in Yorkshire was officially opened last week by Mr. W. H. Sales, chairman of the division.

The full advisory services of the National Coal Board will be available at the new showrooms, which are situated in one of the main shopping streets of the town, and there will also be a retail order office.

Mr. Sales said the centre was one of four which the North-Eastern Divisional Board was establishing—already in operation was the first one at Sheffield. "We shall be opening others as we go on, one at Doncaster and one at Wakefield." He said the centre was staffed by trained personnel who would be able to demonstrate the use of solid fuel appliances and would also be able to advise on matters relating to the Clean Air Act. "This, I am sure, is most important, because it must never be assumed that the coal industry is antagonistic towards the provisions of the Clean Air Act."

Mr. Sales added: "This is something more than a centre and something more than a shop; it is the expression of an attitude and of a policy, and it expresses the determination of the National Coal Board to fulfil what is the primary function of any business—to give service to the customer."

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# *Durham NCB Deputy Chief Scientist Retires*

AFTER completing over 47 years in the coal industry, Mr. J. Gordon, deputy divisional chief scientist, Durham Divisional Coal Board, retired on Tuesday. He started employment as a laboratory assistant with Lambton, Hetton & Joicey Collieries, Limited, Newcastle-upon-Tyne, in 1914, later becoming their chief chemist and manager of the Lambton coking plant.

On nationalization he was appointed chief scientist in No. 2 (Mid-East Durham) Area and for the last 13 years has been carbonization scientist and deputy to the divisional chief scientist. During a distinguished career he has served on many committees, and was the board's representative on the International Standards Panel dealing with coke testing.

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# Welsh Miners' Concern Over Minister's Statement

MINERS' leaders in South Wales, concerned at the statement last week by the Minister of Power, Mr. Richard Wood, that losing divisions of the National Coal Board were being supported by the "profitable heart" of England, which "must drive the board to hard and painful decisions," have asked for a meeting with the South-Western Divisional Board to find out more about the Minister's intentions.

The miners are worried about the effects this hint may have on the division, which last year operated at a loss of £3,655,323, compared with a profit of £375,909 in 1959. In the first six months of this year the division lost £2,044,638.

# *CISWO's Year*

## MORE PROVISION FOR SICK AND DISABLED

IN addition to the provision of recreational buildings and playing fields, the sponsorship of activities in the sphere of sport, culture, and education, the Coal Industry Social Welfare Organization is now making an increasingly important contribution to the care of the sick and disabled, says Lord Robens, chairman of the National Coal Board, in his foreword to the ninth annual report of the organization of which he is also chairman. During 1960, expenditure by CISWO on recreational building works amounted to £373,000 and on recreational ground lay-out £85,000.

Hitherto, says the report, the organization's assistance to sick and disabled mineworkers has been restricted in the main to the clearly defined group of mineworkers suffering from paraplegia, but there has been concern that other sick and disabled mineworkers should not be neglected.

Following surveys by medico-social workers, the Disablement Advisory Committee recommended that the welfare benefit at present authorized for paraplegics should, at the discretion of the Divisional Welfare Committees, be extended to include other disabled mineworkers in receipt of constant attendance allowance, on the understanding that any particular benefit is related to the nature of the disability. The social problems associated with pneumoconiosis is receiving the attention of the Disablement Advisory Committee, the report adds.

### New Centres Opened

During the year new centres were opened and facilities inaugurated or extended as follows:—Scottish Division: Patna, Polkonhall, Savoy Park (Buckhaven), Sanquhar, Tullibody, Bathgate, Musselburgh, Elphinstone, Cumnock, and Rigside. Northern (N&C) Division: Stobswood, Westfield, Burradon, and Hazlerigg. Durham Division: Herrington, Horden, Burnhope, Murton, Ryhope, Brandon, Bowburn, Hylton, Silksworth, Fishburn, and Watergate.

North-Eastern Division: Ryhill and Havercroft, St. Johns, Nostell, Mickelfield Institute, Wharncliffe Silkstone, North Gawber, and Great Preston. North-Western Division: Pendlebury, and the Platt Bridge Institute. East Midlands Division: Derbyshire Miners' Holiday Centre, Skegness, Rhyl Holiday Centre, Bentinck Institute, Ellistown, and Donisthorpe, while community centres are planned at Church Gresley and Coalville. West Midlands: Silverdale, Wimblebury, Hilton Main, Beech Tree and Wollescote, Atherstone, and Victoria and Knypersley, while extensions and improvements to a number of existing welfare schemes are also in hand. South-Western Division: Great Western and Tymawr Hall (Hopkinstown), and Ynyswen. South-Eastern Division: Hersden.

Apart from the provision of buildings and recreational facilities the report gives an account of the many activities of a cultural and sporting nature sponsored by the organization. Angling continued to be a popular outdoor sport of the miner and competitions were held in Yorkshire, Lancashire, and the Midlands with entries reaching the 1,000 mark. A growing interest in athletics throughout the country is shown in the report, while activity continued strong in bowls, golf, boxing, and the more traditional miners' hobbies of brass bands and pigeon racing. Drama and the arts and crafts also flourished.

The report states that there were 305 applicants under the Miners' Welfare National Scholarship and Students' Exhibitions Scheme. Some 70 candidates were interviewed and 40 scholarships, 3 travelling exhibitions and 13 ordinary exhibitions were awarded. Twenty one scholars and eight exhibitioners successfully completed their courses.

## More Miners Against Saturday Working

LAST weekend the majority of Derbyshire's 34,000 miners joined Nottinghamshire colliers in rejecting Lord Roben's plan to boost coal output by Saturday working. Since in the East Midlands Division only miners in Leicestershire have agreed to the scheme, it means that the majority of the 90,000 men in the NCB's most productive division are against the idea.

The decision taken by the Derbyshire Area Council of the National Union of Mineworkers at Chesterfield, is almost certain to be agreed by the individual branches, for voting was 3-1 against. At its meeting on Monday the Yorkshire Area Council, representing 115,000 miners, rejecting the scheme by a majority of 84-19. Delegate decisions have not yet been reached in West Midlands, and Durham Areas of the NUM.

The Coal Mines Regulation (Suspension) Order, 1961, has been made to authorize additional shift working in the mines. The Order came into force on October 25. It suspends until April 30, 1962, the operative provisions of the Coal Mines Regulations Act, 1908, for the period from 2 p.m. Friday until 2 p.m. Saturday. At all other times it will be illegal for a workman to remain underground for the purpose of his work more than 7½ hours plus winding time during any consecutive 24 hours.

Two Derbyshire pits—Shirland and "B" Winning, both in No. 2 Group of the No. 4 (Alfreton) Area, East Midlands Division, have already produced more than 1,000 tons of domestic coal on Saturday shifts. Six pits in the South Derbyshire coalfield have now indicated that they are prepared to start Saturday working from November 11.

THE PETERBOROUGH engineering firm of Baker Perkins, Limited, has decided to close down its heating and ventilating department when all orders now in hand have been completed. It is expected that 1961 will be a record year, but a considerable reduction in orders is foreseen.

*Personal*

# Productivity Council's New Chairman

GENERAL SECRETARY of the Iron and Steel Trades Confederation, Mr. HARRY DOUGLASS has been elected as next year's chairman of the British Productivity Council.

He will succeed the present chairman, Sir Bertram Waring, who is chairman of Joseph Lucas (Industries), Limited, on January 1.

MR. H. DOUGLASS

Mr. Douglass, who has been on the British Productivity Council for four years, is a member of the Iron and Steel Board (part-time) and of the TUC General Council, and is also the TUC representative on the National Production Advisory Council on Industry. At the annual meeting of the Productivity Council in London last week, Sir Bertram Waring emphasized the pressing need to recruit industry's younger men, and said that some of the local productivity committees were already beginning to think in terms of a junior section.

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Mr. JOHN MCKAY, Labour MP for Wallsend (Northumberland) for 16 years, and a former miner, has decided not to seek re-election. He is 76.

Supplies control officer and former deputy at Huncoat Colliery, near Accrington, Mr. W. KENNEDY retired last Saturday after 30 years at the pit and 52 years' service in the coal industry.

Mr. J. G. M. HART, manager of the iron ore department of the Mining and Metallurgical Agency for the past seven years, has left to join the iron ore procurement division of B.I.S.C. (Ore), Limited.

Deputy managing director of the David Brown Corporation, Limited, Mr. ALLAN AVISON recently completed 50 years' service with the company. He started as a 14-year-old office boy earning 5s. a week.

Mr. F. P. S. STAMMERS, chairman and managing director of Radiation, Limited, who is at present in Australia, has had to go into hospital in Melbourne for an eye operation. It is likely to be about eight weeks before he returns to this country.

Mr. JOHN SUGDEN, one of the chief technicians with Pollard Bearings, Limited, of Ferrybridge (Yorks), is visiting the US and Canada to discuss with the Ford Motor Company, Limited, the supply of ball and roller bearings to the Michigan and Windsor (Ontario) plants.

For the past 17 years chairman of Serck, Limited, radiator manufacturers, etc., of Birmingham, Mr. W. H. NEWTON is to retire following the annual meeting on November 24. Mr. Newton, who is 74, began his association with Serck 30 years ago. He will be succeeded by the deputy chairman, Mr. STEPHEN F. BURMAN.

Miss M. E. THOMAS, secretary to Mr. H. W. A. Waring, general managing director of the G.K.N. Steel Company, Limited, and chairman of Guest, Keen Iron & Steel Works, received a presentation at a reception given in her honour at the Savoy Hotel, London, W.C.2, last week to mark her retirement after 40 years' service with the group.

Managing director of Stewart & Gray, Limited, manufacturers of vitreous enamel, of London, S.W.17, Mr N. F. PARKER has been appointed chairman of the Vitreous Enamel Development Council. He succeeds Mr. S. W. Vickery, managing director of Ferro Enamels, Limited, Wolverhampton, who has resigned the position, but who will continue as a director of the Council.

At the annual meeting of the Cleveland Scientific and Technical Institute in Middlesbrough (Yorks), Mr. C. MOODY, assistant general works superintendent, Dorman Long (Steel), Limited, was elected president. He succeeds Mr. S. H. Dunlop, production director, William Gray & Company, Limited, shipbuilders, manufacturers of marine engines, etc., of West Hartlepool. Mr. J. H. WRIGHT, chief metallurgist, Dorman, Long & Company, Limited, was re-elected vice-president.

Managing director of the Greenock Dockyard Company, Limited, ship builders and repairers, Mr. G. MORRISON was appointed president of the Clyde Shipbuilders' Association last Friday. Mr. G. HILTON, managing director of Scotts' Shipbuilding & Engineering Company, Limited, was appointed senior vice-president, with Mr. D. B. KIMBER, a director of the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, junior vice-president. Mr. J. B. CUNNINGHAM, secretary of Barclay, Curle & Company, Limited, Glasgow, was reappointed treasurer.

LORD PIERCY, chairman of the Industrial & Commercial Finance Corporation, Limited, has been re-elected president for the ninth successive year of the Institution of Works Managers. Mr. JOHN AYRES, managing director, Simms Motor Units, Limited, succeeds Mr. A. M. Hudson-Davies as chairman, and Mr. CYRIL STARKEY, technical director, Rozalex, Limited, has been elected deputy chairman. Mr. H. E. DREW, director of electronic production, Ministry of Aviation, has been re-elected honorary treasurer, and Mr. R. S. SILMAN, managing director of Ship Carbon Company of Great Britain, Limited, has been re-elected membership counsellor.

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# *Welsh NCB Marketing Director Retires*

MARKETING director for the South-Western Divisional Coal Board, Mr. Dudley Frederick Pexton, who is 54, is to retire because of ill-health. He was appointed to his present position in 1958. Mr. Pexton began his career in the Yorkshire retail coal offices of the London & North Eastern Railway Company in 1923, and three years later became assistant sales manager for the Carlton Collieries Association, Barnsley (Yorks).

In 1935 he joined the Stanton Ironworks Company, Limited, and was appointed sales manager at the firm's London office. Later he was seconded by Stanton Ironworks to B.S.N. Coal Sales, Limited, the selling agents for open-cast coal produced in Derbyshire, Nottinghamshire, and Leicestershire, returning in 1945 to Stanton Ironworks as coal sales manager and fuel buyer.

Mr. Pexton was appointed assistant divisional marketing officer of the East Midlands Divisional Coal Board on nationalization in 1947, becoming in 1952 marketing manager, a position he held until he moved to the South-Western Division.

*Management Conference*

# BRITAIN LAGS IN QUALITY

## "Few Concerned with Output of Good Work"

BRITISH industry lags behind its competitors, not only in productivity, but in quality, reliability, and value, said Mr. Frank Nixon, consulting engineer (quality) of Rolls-Royce, Limited, at the British Institute of Management's conference at Torquay last week. "It is symptomatic of current British lethargy that nowhere else is progress in the adoption of quality control making such slow headway. The countries of the European Common Market have all accepted the concept."

Mr. Nixon, in an address on "Management and Quality Performance," said that in Britain anything which suggested professionalism was discouraged, whether it was engineering, scientific management, or quality control. "As a result, industry, especially on its manufacturing side, is starved of those trained managers and engineers who would have been able to understand and appreciate the fundamentals."

The most pressing needs in industry, he said, were to spread throughout management an understanding of the importance and value of the control of product quality, and to recruit more trained engineers on to the manufacturing side.

### Progress in Automation

The need for some central body in Britain to focus attention on the importance of automation in industry, to stimulate progress and research, and to co-ordinate the varied activities in this wide field was stressed by Mr. L. Landon Goodman, industrial specialist of the British Electrical Development Association.

Mr. Goodman suggested that a Department of Automation should be established, representative of trades unions, management and the Government, to deal with the problems of automation and speed its introduction. The Department should act as a central planning board and study group, and as an intelligence and information centre. It should have a number of engineers, scientists, sociologists and economists on its permanent staff.

The output of managers capable of filling the top posts in industry was "woefully short of the potential demand," Sir Leonard Owen, member for production and engineering of the UK Atomic Energy Authority, told the conference. He said: "One of the greatest problems facing industry in this country today, in the current era of rapid technical change, is the dearth of men who are capable of fulfilling the onerous tasks of senior management."

He called for an "effective partnership" of schools, higher educational institutions, and industry, to develop potential. The task of the universities was to lay a firm foundation on which industry could build, and it was the job of industry to see its future managers were properly equipped. "This calls for a planned programme of post-university training to be provided by employers and this may extend over five or six years."

Chairman and managing director of Black & Decker, Limited, Mr. Robert Appleby urged management to "break the curtain of committees and formalized relationships" that had separated it from direct contact with the people on the shop floors and in offices. Employees must be given the chance to participate in ownership.

Mr. Appleby agreed that relationships between employees and management through joint consultative procedures had done much good in industry, but these arrangements had separated management from direct personal contact with the people themselves. Management should address employees directly instead of leaving this vital responsibility to representatives.

The need for British industry to be bold and embark on local manufacturing operations in countries abroad was stressed by Mr. E. P. Godden, managing director of Beecham Overseas, Limited. Today there were many countries where this was absolutely necessary, for they were not in a position to afford the foreign exchange required to import large quantities of foreign made finished goods. With a few notable exceptions, he claimed, British goods were not designed or formulated with oversea customers in mind.

Mr. Hugh Weeks, a member of the Economic Planning Board, who recently became a director of Hadfields, Limited, spoke on industrial growth and planning problems.

The necessity for co-operation between Government and industry in technical assistance to the underdeveloped countries was emphasized by Mr. Dennis Vosper, Secretary for Technical Co-operation, at the dinner which brought the conference to a close. A great deal of technical assistance was being given in various ways—many of them unrecognized, he said. Last year over 800 experts were recruited and trained for the dependent territories alone. Nearly 400 high-grade steelworkers had been trained in Britain for the new Durgapur Steelworks in India, to which both the UK Government and industry had made a significant capital contribution.

The biggest change he saw was that there was no longer generally a permanent oversea career for the young university graduate but rather must the UK expect to send people oversea on short-term contracts or on a secondment basis.

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TUNNEL 400 yds. long in which scientists will set off underground explosions to carry out tests into mining hazards is to be constructed at the Mines Research Establishment, Harpur Hill (Derbyshire).

## *Appointments*

Mr. GEOFFREY S. PALMER, has joined James Booth Aluminium, Limited, Birmingham, as chief accountant.

Mr. N. G. FOULKES has joined the International Nickel Company (Mond), Limited, as assistant to the managing director.

Mr. N. R. D. GURNEY has been appointed general manager of Davy-AEI Automation, Limited. He is also a director of the company.

The council of the Southern Counties Institute of Mining Engineers announces the appointment of Mr. R. A. SWIFT as assistant secretary.

Capt. I. F. M. NEWNHAM has been appointed manager of the precision engineering division at Castlereagh, Belfast, of Short Bros. & Harland, Limited.

Following the recent announcement that the C.K.S. Group United Metals has become a public company, Mr. J. A. DEWHURST has been appointed general manager of its Lancashire division.

North British Rubber Company, Limited, Edinburgh, announces the appointment of Mr. COLIN MCINNES as conveyor belting sales manager.

MR. C. MCINNES.

Mr. McInnes joined North British Rubber, an affiliate of the United States Rubber Company, at the beginning of the year as field sales engineer. He will operate from the industrial products sales division at 62/64, Horseferry Road, London, S.W.1.

Mr. JOHN P. EVANS has been appointed manager of the market research department of British Insulated Callender's Cables, Limited, following the retirement through ill-health of Mr. J. R. Halliday.

J. I. Case Company, Limited, has appointed Mr. DAVID H. SLACK as area representative to cover the counties of Lancashire and Cheshire, and Mr. HARRY BRAMHAM as service manager of the Grangefield Depot.

Mr. G. B. JONES has been appointed secretary and chief accountant of Dynamo & Motor Repairs, Limited, a company in the Metal Industries Group. He was previously a management accountant with Evershed & Vignoles, Limited.

Mr. GORDON WANSBROUGH-WHITE, assistant to the group organization and methods officer, Metal Industries, Limited, has been appointed organization and methods officer of the MI group subsidiary, Brookhirst Igranic, Limited. Another Brookhirst Igranic appointment is that of Mr. J. H. COMLEY as production controller at the Bedford works. Mr. Comley was previously with a sister company, Foster Transformers, Limited.

Birmingham University has made the following appointments:—Mr. H. C. BROWN to be research associate in the sub-department of Geophysics in the department of Geology; Dr. F. RIEBAND to be lecturer in the department of mechanical engineering and Mr. E. D. R. SHEARMAN to be senior lecturer in electromagnetism in the department of electrical engineering, both from January 1, 1962; and Dr. D. E. N. DAVIES to be lecturer in the department of electrical engineering.

## "South Wales Strangling Itself With its Own Traffic"

UNIQUE venture—a traffic survey which has extended in scope throughout South Wales—was the subject of Press conferences held simultaneously in London and South Wales on Tuesday. In London, Lord Derwent, chairman of the British Road Federation, said that the Industrial Association of Wales and Monmouthshire—which had decided that it could no longer watch industry in that part of the country strangling itself with its own traffic—had taken upon itself a job which should have been done at public expense long ago.

The country relied on South Wales to provide 25 per cent. of the national crude steel output and expected it to do so with complete efficiency even though the trunk roads, which had to be used extensively, were sadly behind the times. The production of coal was affected, so was that of tinplate, virtually all the country's needs of which were fulfilled in South Wales.

In Cardiff, Mr. David J. Young, chairman of the association's working party on roads which initiated the survey in 1958, and a director of the Steel Company of Wales, Limited, said that if plans for industry had been as dilatory as those for road communications the country would now be in a poor position. He submitted to the Ministry of Transport that the cost of the decrease in efficiency owing to traffic congestion in South Wales was greater than the expenditure that would be necessary to provide adequate road communications.

## *NUM Appoints Part-time Pit Inspectors*

IN an attempt to reduce pit accidents, the Derbyshire Area of the National Union of Mineworkers has appointed five part-time "lifesavers" who will tour pits in the county and make independent inspections. "There has been an alarming increase in pit accidents and we are not satisfied with the present system of inspection," said Mr. Bert Wynn, the NUM Area secretary.

Under the present system each pit is inspected twice a year by three men at the pit. In addition sections of the pit are inspected monthly. Now there will be only one inspector at each pit and the five part-time inspectors will each inspect a group of pits.

## NCB Mine Safety Draw Not Effective

MINE safety draw organized by the Durham Divisional Coal Board is not having any great bearing on the number of mining accidents, state the inspectors to the Philadelphia and District Mines Inspection Board (Co. Durham), in their quarterly report. Under the scheme prizes are awarded to miners who have not been involved in accidents for a certain length of time. The report suggests that each pit should have its own "safety week," when efforts would be made to keep accidents to the minimum.

Criticizing the bad condition of underground roadways for which lack of manpower was often blamed, the report contends that a lot of manpower is wasted dragging heavy girders long distances over low, bad, and restricted roads.

# DURHAM'S COAL PROSPECTS

## *Divisional Chairman's Review*

"A CHANGE in mining techniques to gain higher machine productivity at the face is vital to match the lower prices for untreated small coal required by the electricity industry," said Dr. William Reid, chairman of the Durham Divisional Coal Board, at a meeting of leading men in the Durham coal-mining industry on Monday. Dr. Reid was emphasizing the importance of a greater use of Durham coal by the Central Electricity Generating Board to offset the reduction in demand from other consumers.

The introduction of productivity mining was necessary to keep the coalfield competitive, said Dr. Reid. This would involve the application of the highest productivity machines wherever necessary, consistent with safety and within the limits of market needs.

This year the electricity industry would take more than 3,000,000 tons of Durham coal, compared with 1,400,000 tons in 1957, and it was expected that the total could continue to increase as a new power station for the county was a live possibility.

### Rise in Productivity

Dr. Reid went on to point out that demands from the iron and steel industry, coupled with rising efficiency, had caused a drop in the take of Durham coal from 85,000 tons a week to 40,000-45,000 tons. As a result, prime coking coal stocks were rising, which was serious for west Durham. Encouraging experiments were proceeding with the injection of milled coal into blast furnaces, and he was hopeful that this would supplant the oil-injection method now being increasingly introduced. He also visualized the transportation of milled coal by wagon and then piped into bunkers for use in medium-sized industrial boilers.

In 1958 overall productivity in the division averaged 20.7 cwt. per manshift; 1959, 21.5 cwt.; 1960, 22.1 cwt.; and for 1961 the estimate was 23.0 cwt. More power loading and a growing percentage from reconstructed collieries would raise it to 26.5 cwt. in 1966. "This is a minimum if we are to survive," warned Dr. Reid.

A forward policy of redeployment had avoided large-scale unemployment and hardship. They were continuing that policy and there would be a need for recruitment at some of the reconstructed pits like Wearmouth and Westoe. The Board was anxious to do everything possible to help to attract new industries and a joint meeting of management and unions with the Ministry of Labour and the Board of Trade was being arranged. In addition, the NCB was making available sites and facilities.

On safety, Dr. Reid pointed out there was still far too much thoughtlessness Fatal accidents totalled 12 this year to date, 14 fewer than last year. Fatal accidents in 1959/60 and so far this year, taking the 1958 rate on which to base the estimate, would have totalled 114. The number in fact was 59, so that it was estimated that 55 lives had been saved. This made working for safety worthwhile, though much more could be, and would be done.

Some collieries were losing heavily on every ton produced: five were expected to improve, another might with a major effort now under way. Conditions in another four gave no hope and they required to be dealt with sympathetically, but firmly, for the sake of the whole division. During 1962, a number of small units, involving fewer than 1,000 men would be closed owing to the exhaustion of economic reserves, and the usual inter-pit transfer scheme would apply to minimize redundancy. In addition, there would be several reorganizations. At one of these collieries every effort had been made technically to overcome the formidable geological difficulties without much success, and the reserves there were not realistic.

Dr. Reid said everything was being done to reduce operational and non-operational costs. One group had been eliminated in No. 2 Area and further reductions would be made. Staff had also been cut by some 10 per cent. in the past two years and further economies would be made as a degree of common services between Durham and Northumberland was developed.

## *Modernization Scheme at Blyth Colliery*

PRESENTING long-service certificates to miners at Bates Pit, Blyth (Northumberland), Mr. Leslie Graham, chairman of the Northern (N&C) Divisional Coal Board, referred to the modernization scheme now nearing completion at the colliery, and said he looked forward to the time when a daily output of 3,600 tons would be reached.

MR. L. GRAHAM.

Mr. Graham said he was not asking the miners to work harder but to get the most out of the machines installed at the colliery. The division had achieved several records, but with competition from other fuels increasing, the industry could not manage on records alone if it was to retain the markets it already held.

ADMITTING ASSAULTING Mr. William Linton, an overman, following a dispute over measuring the amount of coal stripped at Lindsay Colliery (Fife), William Whitelaw Adamson, a miner, was fined £6 at Dunfermline Sheriff Court.

*Board Changes*

# Barrow Steel Work's New Directors

DIRECTOR and general manager of Distington Engineering Company, Limited, Mr. G. N. F. Wingate has been appointed chairman of Barrow Steel Works, Limited, following its recent acquisition by the United Steel Companies, Limited, from the Iron and Steel Holding and Realization Agency. Mr. A. Jackson, technical adviser on steelmaking to United Steel, Mr. T. G. Marple, general manager of Barrow Steel Works, and Mr. E. T. Sara, assistant general sales manager of United Steel, have been appointed directors of Barrow Steel Works.

Mr. A. J. Peech, deputy chairman and general managing director of United Steel, remains a director. Sir Walter Benton Jones, the chairman of United Steel, and Mr. Langton Highton, have resigned from the Barrow board.

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Mr. G. B. R. Feilden, managing director of Hawker Siddeley Brush Turbines, Limited, a director of Hawker Siddeley Industries, Limited, and chairman of National Free Piston Power, Limited, is to resign these directorships to join the board of DAVY - ASHMORE, LIMITED, as technical director on December 4.

MR. G. B. R. FEILDEN

Mr. Feilden, who will be based at the group's London headquarters at 15, Portland Place, W.1, will also be joining the boards of the principal operating companies of the Davy-Ashmore group.

HENRY WIGGIN & COMPANY, LIMITED—Mr. R. E. Ansell has become sales director, and Mr. C. Bowles sales manager.

HUGH WOOD & COMPANY, LIMITED—Mr. W. L. Dunn, Mr. H. K. Haig and Mr. M. S. S. Scott have been appointed directors.

S.L.R. ELECTRIC, LIMITED—Mr. Gordon Singleton has joined the board. He was previously with the General Electric Company, Limited.

H. G. SANDERS & SON, LIMITED—Mr. F. M. Menheneott, formerly a managing director of Betts & Company, Limited, has been appointed to the board as executive director.

TECALEMIT, LIMITED—Mr. Nigel J. Bennett has been appointed special oversea representative. He will be making extended tours of oversea countries, commencing with India and Australia. He will continue as managing director of British Filters, Lmted.

BRITISH JEFFREY-DIAMOND, LIMITED—Mr. J. Graham and Mr. P. C. Maccormac have been appointed directors. Mr. Graham was the company's district technical manager for the Yorkshire area from 1939 to 1955, when he became general sales manager of the mining division. Mr. Maccormac, who is a chartered accountant, joined the company as secretary in 1955.

# *Record Output Forecast by Valve Makers*

GREATER value of valves than in any earlier year, surpassing the 1960 figure of £38,200,000 (itself a record) was forecast for 1961 by the chairman of the British Valve Manufacturers' Association, Mr. F. Burgess, managing director of Whites-Nunan, Limited, at the annual meeting on Tuesday. Value of output he said, was up by more than 10 per cent. on the first half of 1960 and exports had also increased.

A recent BVMA inquiry on economic trends in the valve industry indicated that at October, 1961, the rate of total new orders was, in general, higher; the value of uncompleted orders was about the same for non-ferrous valves and only slightly higher for ferrous valves; and the monthly level of output was generally higher. It was, however, limited in some cases by a shortage of skilled labour. In a number of instances had also been affected by a shortage of stainless steel components, such as castings and bar material.

Mr. Burgess is succeeded as chairman by Mr. A. Robertson, managing director of Glenfield & Kennedy, Limited, and becomes vice-chairman. Mr. R. F. Walker (Walker, Crosweller & Company, Limited), joins the executive committee.

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# TI Research Development

CONTINUED growth in specialized fields has called for an expansion of the research and development organization of Tube Investments, Limited, under the direction of Dr. J. M. Kay, whose appointment to the board of TI was announced in April. The central TI organization will consist of a newly-formed engineering development design office, concerned with advancing the specialized engineering of process plant, the metallurgical research laboratory at Hinxton Hall, near Cambridge, concerned with physical metallurgy and metal physics, and a department of technical information in Birmingham.

Organizations for the three main metal-processing divisions are:—A new iron and steel research and development department, with headquarters at Rotherham; a new organization for the steel tube division, which will be developed from the TI technological centre at Walsall; and the British Aluminium laboratory, at Gerrards Cross (Bucks), which will continue to follow research and development on the manufacture and use of aluminium and aluminium alloys.

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## UK Credit Terms Short Says Yugoslavs

HEAD of the Yugoslav trade mission which has been touring Britain, Mr. Dusau Dragosavac said in London on Thursday of last week, that, generally, British manufacturers offered far shorter credit terms than other countries, particularly Western Germany, but this had been improved and he was inclined to look optimistically to the future development of trade relations.

The mission considered that big opportunities existed for Britain in the export of tools, machine tools, and machinery.

## *Company News*

# FUEL CELL DEVELOPMENT

## UK Consortium Forms Research Company

NEW company under the title of Energy Conversion, Limited, to promote research into the development of fuel cells which can be produced commercially, is to be formed by three leading British companies—British Petroleum Company, Limited, British Ropes, Limited, and the G.K.N. Steel Company, Limited, in association with the National Research Development Corporation. The new company, in which all four parties have an equal share, has an authorized capital of £200,000.

Board of the new company, with registered offices at Britannic House, Finsbury Circus, London, E.C.2, will comprise:—Dr. F. E. King and Mr. T. G. McLintock (British Petroleum); Mr. H. Smith and Mr. J. R. K. Buckley (British Ropes); Mr. R. G. Lewis and Dr. T. Emmerson (G.K.N. group), and Mr. J.C. Duckworth and Mr. H. J. Crawley (NRDC).

Research into fuel cells—devices which provide a means of generating electricity directly from chemical energy—has been carried out in this country with the support of the NRDC over a number of years. Although working versions have been demonstrated, none has yet been produced commercially. The NRDC has reciprocal arrangements with two American companies for the licensing of patents and intechange of technical information.

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HERBERT MORRIS, LIMITED, makers of cranes, conveyors, elevators, etc., of Loughborough (Leics)—A final dividend for the year to July 31, 1961, of 10 (12½) per cent., is recommended.

ELLIOTT-AUTOMATION, LIMITED—Application has been made to the Council of the Stock Exchange, London, for permission to deal in and for quotation for an additional £1,500,000 6½ per cent. debenture stock 1981/86.

BIRMID INDUSTRIES, LIMITED—An unchanged final dividend of 3s. per £1 share maintains the total for the year to July 31, 1961, at the previous 4s. rate. Group profits, lower as foreshadowed, amounted, before tax, to £3,016,340 (£3,597,999).

CROMPTON PARKINSON, LIMITED—Group net income for the year to June 30, 1961, expanded to £1,306,000 (£1,261,000), after tax of £1,654,000 (£1,474,000) and dividend is maintained at 12½ per cent. with an unchanged final of 7½ per cent.

CHUBB & SONS, LIMITED, manufacturers of safes and locks, etc., of London, W.1—It has been decided to raise £800,000 by a rights issue to ordinary and "A" ordinary shareholders on the basis of one-for-five ordinary 4s. shares at 20s. 6d. a share.

MANGANESE BRONZE & BRASS COMPANY, LIMITED—Interim dividend for 1961 is being maintained at 4½d. per 5s. share, but, the directors state, whether the final (8d. previously) can be maintained, depends on the position when the full year's results and 1962 prospects are known.

CONTACTOR SWITCHGEAR, LIMITED, manufacturers of automatic electric motor control gear, of Wolverhampton—Profits recovered in the year to July 31, 1961, and, after tax of £98,864 (£65,961), the net profit was £83,037 (£58,209). With an unchanged final of 10 per cent., the total dividend is maintained at 14 per cent.

PROJECTILE & ENGINEERING COMPANY, LIMITED, manufacturing engineers, of London, S.W.8—Interim dividend is being reduced to 4 (6) per cent. and the directors indicate that the final trading results for the year are likely to be "considerably less favourable" than the record results of 1960, when a total of 18 per cent. was paid.

WILLIAMS & WILLIAMS, LIMITED, manufacturers of metal windows and doors, etc., of Chester—The company achieved record sales for the quarter ended July 31, but since then the volume has fallen, says Mr. S. R. Hogg, the chairman, who suggests that the check might be an early repercussion of the effect of Government policy.

SAMUEL OSBORN & COMPANY, LIMITED, manufacturers of high-speed steel and tool steels, twist drills, etc., of Sheffield—Net profit for the year to July 31, 1961, rose to £988,084 (£706,591), after tax of £1,037,774 (£869,716). In deference to the Chancellor's request, the final dividend is maintained at 25 per cent., making a total of 40 (35) per cent.

TUBE INVESTMENTS, LIMITED—Final dividend of 7 per cent., making 14 per cent. for the year to July 31, 1961, is being paid on the £35,341,313 ordinary capital. For the previous year an interim of 8½ per cent. on £16,828,702 was followed by a final of 9½ per cent. on £35,008,573. The net profit is up to £10,364,746 (£9,923,838), after tax of £10,729,225 (£9,663,793).

GREENGATE & IRWELL RUBBER COMPANY, LIMITED, manufacturers of electric cables and wire, of Manchester (Lancs)—Profits for the first six months of the year are considerably down on the corresponding period last year, and it has been decided to halve the interim dividend to 2½ per cent. in respect of the year to March 31, 1962. The 1960-61 total was 12½ per cent.

STONE-PLATT INDUSTRIES, LIMITED—The directors state that it is too early to say what the company's profits will be for 1961, and consider it prudent in present circumstances to revert to the previous practice of paying 4 (4½) per cent. interim dividend. They hope, however, that the forecast of profits given in the chairman's statement last June may be achieved. The total payment for 1960 was 16 per cent.

SMITH'S STAMPING WORKS (COVENTRY), LIMITED—The directors believe the expansion plans of the industries the group serves will, in the long run, enable it

to improve its share of world markets. While plant capacity was not fully employed during the year to August 6, 1961, output increased by some 5 per cent. and this, coupled with the benefit of capital expenditure, enabled a modest increase in profit in a difficult year.

JOHN BROWN & COMPANY, LIMITED—The company has purchased the capital of Talbot-Ponsonby & Company, Limited, precision engineers and mould and die manufacturers, of Langrish (Hants). The business is complementary to that of another John Brown subsidiary, Cravens (Machines), Sheffield, and three of the latter's directors, Mr. J. E. Owston, Mr. H. Booker, and Mr. L. Creighton have been appointed to the board of Talbot-Ponsonby.

JOHN WILLIAMS & SONS (CARDIFF), LIMITED, ironfounders and iron and steel stockholders, etc.—An increase in sales for the period October, 1960, to September this year of 20 per cent. to £3,500,000 over the previous year, established a record. Since the reorganization in 1959 into three main manufacturing divisions, sales have increased by 60 per cent. The company was planning further increases for the coming year, said Mr. Harold E. Williams, sales director, at the annual sales conference in Cardiff.

B. & F. CARTER & COMPANY, LIMITED, manufacturers of wire rope and electric cable-making machinery, etc., of Bolton (Lancs)—The company is raising the distribution on its existing £120,000 capital by 2½ per cent. and proposes to make a one-for-two scrip issue. Following the doubled 5 per cent. interim, the final distribution is maintained at 7½ per cent. dividend and 2½ per cent. bonus, making 15 (12½) per cent. for the year to July 31, 1961. Profit improved to £24,887 (£20,306), after tax of £24,413 (£24,546).

GEORGE M. CALLENDER & COMPANY, LIMITED, manufacturers of bitumen sheeting, of London, S.W.1—Final dividend of 50 per cent. on the ordinary shares makes 97½ per cent. for the year ended June 30, 1961, and a final of 20 per cent. on the 6 per cent. cumulative participating preference shares, makes a participating dividend of 35 per cent., both as for the previous year. Net profit amounted to £44,643 (£46,846) after tax of £23,285 (£23,692). It is proposed to capitalize £60,000 by the issue of 100,000 new preference 10s. shares and 100,000 new 2s. ordinary shares, to be distributed in the proportions of two new preference and two new ordinary for every three preference shares and one new preference and one new ordinary for every three ordinary shares held.

## United Steel Group and Common Market

IF Britain joins the Common Market the United Steel Companies, Limited, will be the largest steel producer of any member country, says Mr. W. Hawkes, United Steel's commercial research manager.

In an article in the Phœnix Gazette, journal of the Steel, Peech & Tozer branch of United Steel, Mr. Hawkes says that to take advantage of the opportunities offered by the Common Market "we must make certain our prices are cheaper and the quality of our products better than can be obtained elsewhere in the Common Market."

He adds: "In terms of quality we have little to fear—but how about prices? Price-wise, all countries will have to be treated as home markets. We shall lose some markets and gain others, but on balance we in United Steel should benefit."

## Britain Can Combine Common Market and Commonwealth

INFORMED opinion in Australia was by no means against Britain joining the Common Market, said Mr. John Oldham, chairman of Oldham & Son, Limited, battery and electrical engineers, of Manchester, at his company's annual motor show dinner in London on Thursday of last week.

MR. JOHN OLDHAM

Describing the economic climate in Australia, Mr. Oldham, who returned recently from a business visit to the Commonwealth, said: "Out of Australia's own 'credit squeeze' has emerged a very strong fellow feeling for Britain's present difficulties. As in England, the man in the street in Australia is coming to realize that Australia must face the fact that the pattern of her trading is changing. . . . No longer can she shelter from the wind of change behind the old imperial preference screen."

Mr. Oldham believed that Britain's entry into the Common Market was essential and inevitable if we were to be strong and stable enough to form the centre of a powerful Commonwealth and community of nations. He also believed that it was possible for Britain not only to form a part of both communities, but to become the "lynch-pin" of both.

Referring to the mechanical handling industry, he said it had one of the most important parts to play in increasing productivity, in conserving labour, and reducing costs. He believed this country was destined to give a world lead for this type of equipment.

### *FBI Director-General's Impressions of Japanese Industry*

ON his return from a three-week visit to Japan where he made a survey of the Japanese economy and trade, Sir Norman Kipping, director-general of the Federation of British Industries, said that in some cases Britain could learn from Japan. The idea that Japanese manufacturers were "pirates" and produced poor quality goods was outdated.

Sir Norman was impressed by the racing growth of Japanese industry—output had been increased by half as much again in only six years—and the high quality of its goods. He was sure the present exchange of goods between Britain and Japan could be built up from the present £50,000,000 a year.

Presentation of a silver tray was made last week to Mr. JOHN P. H. DAWSON, a great-great-great-grandson of Thomas Chambers who, in partnership with George Newton, founded the business of Newton Chambers & Company, Limited, Sheffield, in 1793. Mr. Dawson, who joined the company after the war, was manager of Newton House, Moorhead, Sheffield, which was closed down last May. He has now gone into a tile products business.

**The method currently used for controlling the operation of the rod mill at John Lysaght's Scunthorpe Works, Limited, the calculations required by the method and the way in which they are done, and the cost are described in this paper. Mr. Hook is works manager of John Lysaght's Scunthorpe Works, while Mr. Rickett is senior programmer, Yarrow & Company, Limited, Scotstoun, Glasgow.**

# Rod Mill Operation

## SPEED-CONTROL METHOD FOR CHECKING DRAUGHTING

by E. C. HOOK and J. I. RICKETT, M.A.(Oxon)

IN the summer of 1959, the rod mill was modified to give a greater throughput involving an average 20 per cent. increase in the finishing speed of the rod product. In its present form the mill is of the continuous type in which two strands of rod are rolled in parallel, producing rods from ⅜-in. dia. down to 5 gauge from a square billet of 2¼-in. side. The output is currently running at the rate of about 200,000 ton/annum.

The mill consists of a roughing train, intermediate train and finishing train. The roughing train of nine stands in close sequence is driven by five independent electric motors, and in this train the square billet is reduced from 2¼-in. square section to a round of 0.285 sq. in. minimum cross-sectional area. The intermediate train of six stands in coupled pairs is driven by three independent electric motors. In this train the rod section is reduced to a minimum of 0.077 sq. in. round cross-sectional area. The finishing train of six coupled stands driven by a single motor reduces the section to 5 gauge minimum. Thus the mill consists of a maximum of 21 stands driven by nine independent motors.

Each pair of rolls forming a " stand " changes the shape and reduces the cross-sectional area of the rod, or " stock," passing through it. This must, of course, increase its length. Since the mill operates continuously, with billets following nose to tail, a constant volume of material per unit time is passed through each roll pair and with reduction of cross-sectional area, a corresponding increase in length must be catered for. This increase in length is taken up by increase in speed at each successive pair of rolls. Since this increase in length and the consequent increase in speed results from a decrease in cross-sectional area, it is obvious that any variation of cross-sectional area will be reflected in the recorded roll speed.

### Conventional Draughting Practice

The mill designer sets out the standard draughting, *i.e.*, shape size and parting between the rolls forming a pair, carefully worked out to give the optimum reduction in area at each pair of rolls. In the past, however, the mill " roller " in charge has been in some difficulty because of the impossibility of measuring accurately the size of the stock throughout the mill while it is in operation. To check stock size by passing short pieces through each stand would be a long and laborious process and, moreover, could not be guaranteed to give accurate results, since temperature as well as stock size plays an important part.

It had been former practice to adjust roll speeds to avoid stretch or buckle of the stock running through the mill, together with some adjustment of draughting on a trial and error basis. This method of working very often resulted in overfilling of one or more roll pass resulting in a " lap " at the following pass. These defects are extremely difficult to find even in the wire-drawing stage and are often undiscovered until the end product has been manufactured. It was decided that all these difficulties had to be overcome if the potential of the mill were to be fully exploited with the quality of the product maintained or improved at the increased output.

The factors of importance in rod rolling are:—

(*a*) Draughting:
should be accurate, but is not easily measured by checking stock size.

(*b*) Stretch of stock:
can be seen by the practised eye and shows prominently at various places if

excessive. Buckle of stock: easily seen and self evident.

(*c*) Speed of rolls: must be accurate and can easily be measured.

If any two of these factors are correct then the third will also be correct. Since factors (*b*) and (*c*) can easily be checked, it follows that the best approach to control is the formula

$$\left.\begin{matrix}\text{no stretch}\\ \text{or buckle}\end{matrix}\right\} \text{plus} \left\{\begin{matrix}\text{accurate}\\ \text{speed}\end{matrix}\right\} \text{gives} \left\{\begin{matrix}\text{correct}\\ \text{draughting}\end{matrix}\right.$$

The standard for the mill rolls is set by the designer and, therefore, given the theoretical speed at which any particular roll pair should turn, a check on the actual speed will indicate the degree of error in the draughting and allow a precise correction to be made. The mill can then be operated under optimum design conditions. Since the finishing speeds of the product can vary over a wide range and all rolls can be used at various diameters, it can be seen that separate calculations are necessary for every change of roll size and every speed and that the number of calculations required to cover all conditions for all stands in a reasonably comprehensive and useful manner, will be very large. Each size of rod produced requires this treatment.

### Calculations for Speed Control Method

Taking the case for 5 gauge rod, in which the finishing speed can vary between 6,500 and 4,500 ft./min., taking 100 ft./min. steps for varying roll sizes requires something like 3,600 values of roll speed to be calculated. Fourteen different sizes of rod are rolled in the rod mill and to cover each would involve a total of about 45,000 calculations. It was therefore decided to produce a trial set of roll speed tables for 5 gauge using an electronic computer.

The computer used to perform these calculations was one of the latest small size fully transistorized type manufactured by Ferranti, Limited, Hollinwood (Lancs). Although this machine, called Sirius, is of very small physical size for a computer, it is of relatively high speed and is capable of a maximum of 4,000 logical steps per second. The Sirius is a decimal machine using nickel delay line storage with nine immediate access short storage lines or accumulators. The order code is simple, yet comprehensive, and extremely easy to grasp. Display of orders or selected accumulators is in decimal form which is immediately intelligible to the operator. This facility is extremely useful to the programmer when he is testing programmes. The machine can be operated automatically from two orders per second to the maximum of 4,000/sec.

The type of calculation required for the rod mill rolling speeds involves the output of a very large amount of data. Data output, even using the most up-to-date equipment is a time-consuming operation relative to machine calculation, and on this type of problem well over half the time is spent in getting the answers out of the machine. Hence, to a certain extent, the speed of calculation in the machine is unimportant. However, as the cost of the calculation is based on machine time used, which includes output time, the calculation costs less to perform on a small machine where, in general, the cost per hour is low. Thus the Sirius proved to be ideal for this work.

The calculation method used was simply that of constant volume flow per second through any section of the mill. The product of the finishing speed and cross-sectional area of the finished rod gives the volume flow rate, which is constant for all stands. Division of this constant by the cross-sectional area at any given roll pair gives the velocity of the stock at that point. From a knowledge of the roll diameter, the roll parting and the depth of the rolling groove this velocity can be related back to roll speed. As all the roll pairs are gear driven, the roll speed can be related to the roll motor speed in rev./min. The motor speed can easily be measured to a degree of accuracy which is more than sufficient.

### Economics

Dealing now with the economic side of this work, the trial set of calculations for 5 gauge required a completely new computer programme which took about two days to write and test; the data and the output styling took a further 6 hr. to punch and check. Because of the trial nature of the whole work, the calculation was not made fully automatic and, in consequence, the calculations took nearly 50 min. of computer time. The printing out of the output tape from the computer took a further 2 hr.

On the standard rates which are charged the bill would be as follows:—

| | £ |
|---|---|
| Programmers' time .. .. .. | 24 |
| Data preparation .. .. .. | 6 |
| Machine time .. .. .. | 20 |
| Output printing .. .. .. | 2 |
| Total | 52 |

This is not much more than the sale price of *1 ton* of 5-gauge rod.

If this is surprising, consider the cost of a batch of calculations for rod sizes 2/0, 4/0, 7/0 run all in one period of machine time. The original 5 gauge programme would be slightly modified and fresh data relative to the sizes considered would be prepared. The calculation could be made fully automatic with a considerable saving in machine time, and the bill would read:—

| | £ |
|---|---|
| Programmers' time .. .. .. | 6 |
| Data preparation .. .. .. | 6 |
| Machine time .. .. .. | 25 |
| Output printing .. .. .. | 3 |
| Total | 40 |

This is an average of just over *£13 for each size of rod* considered.

The trial set of 5 gauge calculations have been set out in booklet form and the booklet has been

used for several months now in the mill for checking the roll speeds and draughting of the rolls.

A remote reading revolution counter has been installed in the mill manager's office so that he can check the motor speeds easily merely by turning a switch. With this new system it is claimed that by measuring accurately the roll speeds and comparing them with the calculated speeds, there is no difficulty in seeing instantly the amount of variation from the standard draughting. The standard draughting may not be accurate, but the variation can be controlled to give an even variation throughout the mill and thus avoid overfilling and overloading any pass.

**Practical Results**

This system *does not* eliminate the necessity for avoiding stretch; buckle of the stock will take care of itself since the mill cannot operate with even the least sign of buckle. The stands are so close together that a buckle is soon followed by a "cobble," *i.e.*, a knot failing to pass through the roll stock guides.

Most important of all, it has been shown at the rod mill that this method of control produces tangible results and has been justified economically. It has been accepted by the men on the mill floor, it is simple to operate, has resulted in a lower frequency of cobbles, more exact draughting, and a time saving in adjustments to the mill stands.

**Future Development**

Whether this method is the best, short of full electronic automation, remains to be seen. The whole idea is still in its infancy. As more people accept the idea and become more interested in this aspect of mill control, from economic or other reasons, improvements on the theory used may be made and speeds may be recalculated. Other forms of presentation may be shown to be more useful. It is almost certain that the calculations will be extended to cover all the sizes of rod rolled in the mill.

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The authors are indebted to the directors of John Lysaght's Scunthorpe Works, Limited, and of Yarrow & Company, Limited, for permission to publish this article.

# *Big Electric Stress-relieving Furnace*

ELECTRIC stress-relieving furnace, measuring 27 ft. by 27 ft. by 80 ft., being installed at the Thornaby-on-Tees works of Head Wrightson Teesdale, Limited, a subsidiary of Head Wrightson & Company, Limited, is believed to be the largest in the world. The furnace is capable of stress relieving large fabrications, such as oxygen steel converters, and will be used in the fabrication of the boilers for the nuclear power station at Dungeness.

Cooper Electroheat, Limited, which designed the furnace, has used a novel form of construction and incorporated many new ideas in the design. An important feature is that no firebrick is used anywhere in the furnace. The actual construction of the furnace is being carried out by Head Wrightson Teesdale; it has already been used for stress relieving fabrications weighing 50 tons. The hearth, walls, and roof are constructed generally from 8-ft. by 8-ft. mild-steel panels which are filled with compressed mineral wool slabs and secured with flexible mild-steel sheeting. The roof panels are affixed to longitudinal rolled steel joists at roof truss height. The side walls, carried by "A" frames and mounted on bogies, are easily retractable. The end walls can be lifted into position in two sections by means of a mobile crane.

Fabrications to be stress relieved are supported on cradles and carried on bogies which carry the furnace floor, also in panel form.

A 40-ft. length of the furnace is now completed and in this section a fabrication was stress relieved within limits of 610 deg. C. minimum and 630 deg. C. maximum. The furnace is designed so that it can be dismantled and re-erected elsewhere or altered to admit smaller or large fabrications. The lightweight high-efficiency mineral slabs need less heat than refractory bricks. Heating is by convection currents of hot air inside a closed furnace with no flue, and oxidization of fabrications is therefore negligible.

Longitudinal expansion of fabrications is taken up by individual bogies which move relative to each other.

The designers, Cooper Electroheat, supplied the furnace panels and electroheat units, while Head Wrightson Teesdale manufactured and installed the bogies and supporting structure.

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**Plan to Dredge Nab Shoal**

Esso Petroleum Company, Limited, is planning, in conjunction with the Southampton Harbour Board, to remove by dredging the present obstacles to deep-draughted ships formed by the Nab Shoal (off the east coast of the Isle of Wight), and in the inner approaches to the refinery at Fawley. At present, ships proceeding to Fawley are limited to a maximum draught of 41 ft. at neap tides. The arrival draught, fully laden, of Esso's latest 77,000-deadweight ton tankers now under construction is 47 ft.

# Forthcoming Events

NOVEMBER 6

*North Staffordshire Institute of Mining Engineers*:—Meeting at the North Staffs College of Technology, Stoke-on-Trent, at 5.30 p.m. Students' question night.

*Institution of Mechanical Engineers (North Eastern Branch)*:—Meeting at Neville Hall, Westgate Road, Newcastle-upon-Tyne, at 6 p.m. "Metallurgy in Relation to Mechanical Engineering," by J. A. Brown.

*Institute of British Foundrymen (Sheffield and District Branch)*:—Joint meeting with the Chesterfield and District Foremen's Association at the Odeon Ballroom, Chesterfield, at 7 p.m. "Man and His Machines," by Sir Ben Lockspeiser.

*Society of Instrument Technology (Control Section)*:—Meeting at Manson House, 26, Portland Place, London, W.1, at 7 p.m. "Semiconductor Diodes and Rectifiers in Control Engineering," by P. R. Wyman, and "The Transistor in Control Engineering," by Dr. G. D. Bergman.

*Society of Engineers*:—Meeting at the Geological Society, Burlington House, Piccadilly, London, W.1, at 5.30 p.m. "The 'Untouchable' Therm: Some Thoughts on Design Trends in Central Heating and Hot-water Supply Installations," by G. E. Cox.

NOVEMBER 7

*Leeds University Union Mining Society*:—Meeting at the Department of Mining, The University, Leeds 2. "Copper Mining at Rhokana, Northern Rhodesia," by M. W. Stephenson.

*Combustion Engineering Association (Northern Region)*:—Meeting at the Grand Hotel, Leopold Street, Sheffield, at 11 a.m. "Fuel Selection for Heating Processes in the Steel Industry." Papers by:—oil: L. Savage (Esso Petroleum Company, Limited); coal: L. A. Willsmere (National Coal Board); gas: F. Dickinson (East Midlands Gas Board); electricity: A. Haddock (Yorkshire Electricity Board).

*Institution of Mechanical Engineers (North Eastern Branch)*:—Meeting at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 6.15 p.m. "Metallurgy in Relation to Mechanical Engineering," by J. A. Brown.

*Institution of Plant Engineers (London Branch)*:—Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Pilot-scale Research Work at the DSIR Warren Spring Laboratory," by S. H. Clarke.

*Institution of Plant Engineers (Peterborough Branch)*:—Meeting at the White Lion Hotel, Church Street, Peterborough, at 7.30 p.m. "Application of Modern Industrial Switch and Control Gear," by P. C. Belton.

NOVEMBER 8

*Combustion Engineering Association (Scotland)*:—Meeting at the Grand Hotel, Charing Cross, Glasgow, at 10 a.m. "The Design and Installation of Industrial Boiler Plants," by A. F. Webber.

*Institute of Marine Engineers (Scottish Section)*:—Meeting at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7.30 p.m. "The Development of Heavy-duty Marine Diesels During the Past Five Years," by W. Kilchenmann.

*North Wales Metallurgical Society*:—Meeting at Flintshire Technical College, Connah's Quay, near Chester, at 7 p.m. "Recent Research on Steelworks' Refractories," by Dr. J. White, Dyson Professor of Refractories Technology, Sheffield University.

*Royal Society of Arts*:—Meeting at John Adam Street, Adelphi, London, W.C.2, at 2.30 p.m. "Vocational Training and Industrial Rehabilitation," by G. H. Cullen, manager, Ministry of Labour Government Training Centre and Rehabilitation Unit, Perivale (Middx). Tickets for non-members from the secretary.

*Institute of British Foundrymen (Scottish Branch)*:—Meeting at 3 p.m. "Foundry Planning and Production Control," by D. McLean.

*Institution of Mechanical Engineers*:—Meeting at 1, Birdcage Walk, London, S.W.1, at 6 p.m. "Gear-tooth Contact Phenomena," by Dr. H. E. Merritt.

*Institution of Production Engineers (Preston Section)*:—Meeting at the Harris College, Corporation Street, Preston, at 7.30 p.m. "Spark Erosion," by P. J. C. Gough.

*Institution of Production Engineers (Edinburgh Section)*:—Meeting at the North British Hotel, Princes Street, Edinburgh, at 7.30 p.m. "Flow Turning," by E. J. Bennett.

*Institution of Plant Engineers (Western Branch)*:—Meeting at the Grand Hotel, Broad Street, Bristol, at 7.15 p.m. "Organization of Planned Maintenance," by H. Bamford-Preston.

NOVEMBER 9

*West Cumberland Metallurgical Society*:—Meeting at the Primary School, Seascale, at 7.30 p.m. "Electron Microscopy," by Prof. J. Nutting (University of Leeds).

*Institution of Mechanical Engineers (Eastern Branch)*:—Meeting at the Gaumont Restaurant, Northampton, at 7.30 p.m. "Movement in a Ballbearing," by E. G. Longman.

*Institution of Mechanical Engineers (North Western Branch)*:—Meeting at the College of Science and Technology, Manchester, at 6.45 p.m. "Consideration of the Lubrication of Free-piston Gas Generators," by R. M. Hoise and G. M. Barrett.

*Institution of Mechanical Engineers (Southern Branch)*:—Meeting at Durley Hall, Durley Chine Road, Bournemouth, at 7.30 p.m. "Development of Extrusion and Forging Machinery," by a member of the staff of the Loewy Engineering Company, Limited.

*Institution of Production Engineers (London Section)*:—Meeting at the Royal Aeronautical Society, 4, Hamilton Place, London, W.1, at 7 p.m. "Cold Forging," by F. Griffiths.

*Institution of Plant Engineers (Glasgow Branch)*:—Meeting at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, C.2, at 7.15 p.m. "Industrial Air Conditioning," by V. C. Taylor.

*Institution of Plant Engineers (North East Branch)*:—Meeting at Roadway House, Oxford Street, Newcastle-upon-Tyne 1, at 7 p.m. "Automatic Boiler Control for Medium- and Small-size Boilers," by a representative of James Gordon & Company, Limited, Stanmore (Middx).

NOVEMBER 10

*Southern Counties Institute of Mining Engineers*:—Meeting at 3, Grosvenor Crescent, London, S.W.1, at 3.30 p.m. "Operational Research and its Application in the UK Coal Industry," by Dr. B. T. Houlden.

*North East Coast Institution of Engineers and Shipbuilders*:—Meeting at the Mining Institute, Newcastle-upon-Tyne, at 6.15 p.m. "Photo-elasticity and its Application in Marine Engineering Research and Development," by J. West and F. S. Lynam.

NOVEMBER 11

*Institution of Plant Engineers (Edinburgh Branch)*:—Meeting at 25, Charlotte Square, Edinburgh, at 7.30 p.m. "Gas in Industry," by A. Mackechnie, industrial gas officer, Scottish Gas Board.

NOVEMBER 13

*Lincolnshire Iron and Steel Institute*:—Meeting at the North Lindsey Technical College, Kingsway, Scunthorpe, at 7.30 p.m. "Production and Distribution of Tonnage Oxygen at Appleby-Frodingham," by G. Gibson, plant engineer, oxygen plant, and W. Calvert, assistant fuel engineer and services officer, Appleby-Frodingham Steel Company.

*Institution of Electrical Engineers (Scottish Branch)*:—Meeting at the Royal College of Science and Technology, Glasgow, C.1, at 6 p.m. "Numerical Control of Machine Tools," by D. F. Walker.

*Institution of Production Engineers (Halifax and Huddersfield Section)*:—Meeting at the Percival Whitley College of Further Education, Francis Street, Halifax, at 7.30 p.m. "Design and Development of Machine Tools," by C. A. Sparkes.

## National Association of Colliery Managers

NOVEMBER 6

*South Midland Branch*:—Meeting at Ashby Rescue Station at 4 p.m. "The Application of Photographic Methods to Mining," by W. Unsworth and D. Ottey.

NOVEMBER 13

*Midland Branch*:—Meeting at West Notts Technical College, Mansfield, at 6.30 p.m. Paper by N. Fricker, marketing director of the East Midlands Divisional Coal Board.

NOVEMBER 18

*North Staffs Branch*:—Annual dinner and dance at the North Stafford Hotel, Stoke-on-Trent.

NOVEMBER 21

*Yorkshire Branch*:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. "Manpower Deployment," by J. Claxton-Smith.

NOVEMBER 22

*Lancashire Branch*:—Meeting at the Manchester Literary and Philosophical Society, 36, George Street, Manchester, at 3 p.m. Lord Robens, chairman of the National Coal Board, will give an address on current affairs in the industry.

# *With the ISI in Canada*

## SIGHTSEEING AND INDUSTRIAL TOURS

### *from C. W. J. CRAWFORD*

*(Metallurgical Editor)*

CONTINUING their special meeting in the United States and Canada, members of the Iron and Steel Institute last week spent four days in Niagara Falls, Canada. Members were literally living on the Canadian border and crossing almost daily into the US and back on sightseeing and industrial tours in both countries. Passports had thus to be constantly to hand.

The long train journey of 435 miles from New York Central station to Buffalo, followed by the 20-mile coach trip to Niagara Falls, might sound a somewhat wearying affair. But in the superb comfort of a special fast train, appropriately constructed almost entirely of stainless steel, and with sunny weather and magnificent scenery full of autumn tints, the time passed quickly and enjoyably.

The first visit in Canada was to the research laboratories of the Linde Company and the Union Carbide Metals Company, where many of the things to be seen and heard were of special interest to steelmakers. The Linde Company, which produces industrial gases, devotes considerable research effort to improving gas production processes and methods of using the gases produced and to developing new uses for them. With the upsurge of oxygen steelmaking in recent years this company has concentrated its attention to this field and more recently has carried out studies of oxygen injection in the blast furnace.

Recently developed techniques in oxygen steelmaking make the question of the future of the open-hearth furnace even more debatable. Thus data on work carried out by Linde in co-operation with steel companies have shown that by injecting oxygen through several roof lances production rates of up to 100 ton/hr. can be obtained. Operating values for a 420-ton open-hearth furnace charging 65 to 70 per cent. hot metal are:—Total oxygen injected from roof lances, 1,200 to 1,300 cu. ft./ton of steel; total fuel consumed, from 500,000 to 1,000,000 B.t.u./ton of steel, giving a production rate ranging from 80 to 100 ton/hr. These values make it sound as though the open-hearth furnace can match all newcomers, but the Linde Company also gave information about its development of an oxygen-natural gas burner that can deliver 5,000,000 B.t.u./hr. to a converter and thus make the oxygen steelmaking furnaces work with much greater proportions of scrap in the charge. In other words, the oxygen furnaces can have a flexibility of burden composition similar to that of the open-hearth furnace.

An oxygen-natural gas burner of this type has already been used on an electric arc furnace for rapid melting down of scrap in the initial stages of the process. The results given in Table 1 show the advantages resulting from the use of this burner on a 140-ton arc furnace.

TABLE 1.—*Advantages Resulting from the Use of an Oxygen-natural Gas Burner on a 140-ton Arc Furnace.*

| | Standard practice. | Using oxygen-natural gas burner. | Gain per cent. |
|---|---|---|---|
| Heat time ... | 2 hr. 57 min. | 2 hr. 19 min. | 21.4 |
| Power, kWh/ton | 519 | 428 | 17.5 |
| Production rate, ton/hr. ... | 47.4 | 60.5 | 27.7 |
| Oxygen, cu. ft./ton ... ... | — | 755 | — |
| Natural gas, cu. ft./ton ... | — | 367 | — |

From observations made at the Steel Company of Canada the future of the open-hearth furnace seemed assured. At this shop one of the open-hearth furnaces has been enlarged to tap 500 tons and equipped with oxygen roof lances similar to those used at the Abbey Works at Port Talbot. Its output rate averages 100 ton/hr. This furnace was tapped by a jet explosive during our visit, this being just one of many examples of the Canadian steel industry's successful introduction of new techniques to reduce labour and improve quality controls.

Linde's blast-furnace studies indicate that iron production can be increased by the injection of various types of fuel and oxygen almost as much as steel production is increased by using oxygen. There are several injection techniques which are proving worthwhile and others, such as a method of injecting pulverized coal, are being developed.

At Dofasco the injection of fuel oil alone is a routine practice of several months' standing. The fuel oil is injected at each tuyere, the total input being 133 lb./ton of iron produced. The resultant coke consumption is about 14 per cent. less and output 5 per cent. more. Furthermore, it has been shown that the use of fuel oil containing up

to 2.25 per cent. sulphur has no significant effect on the sulphur content of the iron.

At the works of the Steel Company of Canada, Hamilton, Ontario, we had the opportunity of seeing natural gas injection. At the blast-furnace plant two of four furnaces are regularly injecting natural gas. The equipment for injection is simple. The gas passes via a 1-in. dia. pipe which enters the tuyere a little below the inspection hole and terminates in the hot-air blast some 6 in. short of the tuyere opening. The end of the injection pipe is "stopped down" to a ½-in. dia. hole. Experience here has been with natural gas injection rates varying from 1,000 to 2,000 cu. ft./min. and it has been established that each 1,000 cu. ft. of gas saves 100 lb. of coke per ton of iron. However, the advantage of natural gas injection is limited to amounts of 4 to 6 per cent. of the hot-air blast.

### More Effective Injection Practice

A more effective injection practice is to inject natural gas, fuel oil, and oxygen together. This practice has been investigated by the Colorado Fuel & Iron Corporation, Pueblo, Colorado. The institute did not visit this company, but, according to published information (Iron Age, October 5, 1961), a special burner is used in which natural gas atomizes liquid fuel at a short distance from the tuyere opening and both fuels enter the furnace together. The oxygen is supplied to the cold air by a diffuser pipe before it enters the hot-blast stoves.

The equipment for injection of fuel oil alone is not as simple as that for natural gas alone. Heating of the circulating line is necessary to ensure an even flow. It is also necessary to deliver the oil right into the furnace, otherwise it will produce a gummy layer inside the tuyere and lead to a blockage.

Other developments linked to industrial gas utilization concern the surface finish of products. Scarfing equipment has been improved and hot scarfing of slabs is fast becoming general practice in the USA. Some simplification of annealing atmospheres is also indicated by Linde researches, which have shown that the use of high-purity nitrogen (containing not more than 10 p.p.m. of oxygen) as an annealing atmosphere gives a sheet free from oxidation.

Welding and flame-cutting processes are also in a rapid state of development at the Linde Company's laboratory, one example being a plasma arc torch capable of cutting stainless steel of 4 in. thickness at a rate of 5 in./min.

The Dofasco steelworks at Hamilton, Ontario, shows evidence of original approaches to problems of expanding the production of its various units. Its 66-in. wide strip mill produces 1,200,000 tons annually in what must be the shortest of strip mill buildings. The slab ingot from the soaking pit is first rolled in a 2-high reversing mill, where it receives anything up to 17 passes to reduce it to ⅞ in. thickness. It then approaches a Steckel mill. This mill fascinated most members of the party. The long length of ⅞ in. thick 66-in. wide material passes through the 66-in. 4-high hot Steckel mill and into a coiling chamber and then passes back through the Steckel mill into a coiler chamber on the approach side. It passes again through the Steckel mill before entering the 3-stand continuous hot mill. The Steckel mill with its coilers occupies relatively little space, but does the work usually done by three 4-high, well-spaced stands in the normal strip mill layout. Economy of space likewise seems to have led to the use of a reversing mill for cold reduction. This 4-high 56-in. mill produces 12,000 ton/month of cold-reduced strip, up to seven passes being given according to gauge requirements.

A few years ago Dofasco decided to expand its steel production by means of top-blown oxygen converters which were, at that time, untried outside Austria. It operates three vessels of 105-ton nominal capacity and one of 50-ton nominal capacity. The 105-ton vessels now charge 130 to 160 tons and have a cycle time of about 45 min. Here again, it is a case of a high rate of production per unit area. It was certainly an impressive sight to see 150 tons of hot metal being blown to steel.

Another "first" claimed by Dofasco is the installation of open-coil annealing equipment. This is used both for ordinary annealing and for reducing the carbon content of steel strip from 0.05 to 0.005 per cent. The economics of open-coil annealing are not attractive, but the ability to produce a superior vitreous enamelling deep-drawing quality sheet may well pay dividends in a competitive market.

### New Project of Atlas Steels

The opportunity to observe continuous casting and reduction of stainless steel slabs in a hot planetary mill at the plant of Atlas Steels, Welland, Ontario, took on a special significance at the time of the institute's visit because on the previous day the company had announced a $40,000,000 project at Quebec, Montreal. Although details of this plant have yet to be announced, suffice it to say that it will be based on the company's experience of continuous casting and planetary hot reduction of stainless steel, but will be for a substantially wider sheet. Maybe we shall see continuous casting linked directly to a Zendzimir hot planetary mill.

At the time of the visit to Atlas Steel we saw the continuous casting of 8¼-in. square sections and exhibits of etched sections of 7½-in. and 8-in. squares and 6¾-in. by 24-in. slabs. On the hot planetary mill 2¼-in. thick slabs of stainless steel were being reduced to 0.20-in. strip for subsequent cold reduction on Zendzimir mills.

Our visit to Canada was not only rewarding technically, but also in its rich show of lakes and autumn-coloured landscapes and in the hospitality of the people.

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JOINT VENTURE to carry out iron-ore exploration in Western Australia has been formed by Consolidated Gold Fields (Australia), Pty., Limited, Cyprus Mines Corporation of Los Angeles, USA, and the Utah Mining & Construction Company.

*Management in its routine daily work has reduced accident injury frequency and severity very considerably, but the current annual record of the industry gives the mining engineer no joy in reading it, says the chairman of the Durham Divisional Coal Board in this paper, which he presented at the annual conference of the National Association of Colliery Managers, held at Edinburgh from June 6 to 8. Progress, he says, is too slow. What is mainly required is strength of leadership from the top, a staff of safety engineers and officers inspired and devoted to the task, and a general acceptance by colliery managers that greater safety can be achieved.*

# Campaigning for Greater Safety

**by WILLIAM REID, Ph.D.**
(*Chairman, Durham Divisional Coal Board*)

SINCE 1842, accident prevention in coal mining in Great Britain has been the subject of numerous Acts and regulations as well as directives of a non-statutory nature within the National Coal Board from 1947—all with a view to setting down minimum standards of operation and personal conduct. In addition, such professional bodies as the National Association of Colliery Managers, the Association of Mining Electrical and Mechanical Engineers, and the Institution of Mining Engineers have devoted considerable attention to the solution of safety problems, and the specialist work of universities and colleges has made a significant contribution. The Mines Inspectorate, too, has for many years wielded an increasing influence by observation and advice in a practical fashion. In the years since vesting date, the industry's Safety Branch, with its staff of engineers at headquarters, division, Area, and colliery levels, has been trying to create the atmosphere and awareness which will make greater safety an important factor in the technical and social advance of coal mining in this country.

Progress to greater safety has been significant in the last 25 years. This is clearly shown by a comparison of the fatal accident rates in 1935 and 1960, which were 0.43 and 0.22 per 100,000 manshifts, respectively (Fig. 1), but recently progress has been too slow to give any peace of mind to the colliery manager.

Perhaps too much reliance has been placed on the written words of the Acts and regulations relating to mine safety without the full realization that a safety Act does not create the spirit of compliance, nor can it cover the varying circumstances to be met in differing combinations in coal mining.

Coal mining is unlike most other industries in that the working place of more than one third of those employed changes every working day. In addition, ventilation and lighting are wholly artificial, and systematic supporting of the roof, floor, and sides of the working places is necessary to counter the natural physical hazards of working underground. Safe working conditions require to be constantly re-established—a major task demanding the keenest supervision and considerable manual skill. The unsafe acts of individuals are less readily discovered and corrected before an accident causing injury can occur.

With supervision so difficult, the radical change made under the 1954 Mines and Quarries Act,

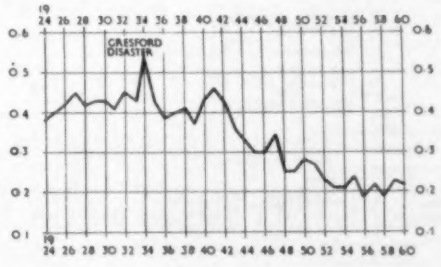


FIG. 1.—FATAL INJURIES PER 100,000 MANSHIFTS (GREAT BRITAIN).

Section 193, in emphasizing the common law duty owed by a master to a servant, is a very onerous one. It places much greater responsibility on the supervisory official both for his own personal conduct at work and the conduct of others.

In addition, the more recent revolutionary changes in mining methods have brought new hazards to replace old ones, and the improvement of the conditions under which men work and travel seems to cause some reduction in their awareness of danger. This is borne out, for instance, by the recent occurrence of serious accidents associated with locomotive haulage in large level roadways. In the majority of these cases, risks were taken which would scarcely have been contemplated had the roadways been small and on a gradient. These technical changes require, as never before, new counter measures with high quality leadership on the job.

It must be kept in mind that technical progress can only go on unhindered if it brings with it a lower rate of accident injuries. It is also true to say that where the overall accident injury rate is low and due attention is constantly paid to good mining practice, the liability to serious injury is less. Hence the importance of the overall rate as an indication of the general safety standard at any colliery.

## THE COSTS OF ACCIDENTS

Accidents are costly from both the humanitarian and financial viewpoints (Fig. 2). The first and premier cost, which cannot be valued in sterling, is the grief and human suffering borne by the family and the victim. This is reflected in the community life of the mining village, where fatalism sometimes predominates among both officials and men. A substantial reduction in accident injury frequency would have a telling effect on community outlook, and perhaps on recruitment as well.

The second cost is seen in the outstanding proportion of injury benefit paid for mining accidents under the Industrial Injuries Act. To this should be added the supplementary injuries payments and the ever-growing annual cost to the industry of common law damages. But these compensations can never make up for the loss of human faculties when permanent damage is done.

The third cost occurs when the accident happens. Production is dislocated and output may be lost on the accident shift and also on others that follow. Accidents reduce productivity, and from this angle alone are much more expensive than the cost of common law damages.

The fourth cost is the reduction of manshifts resulting in higher absenteeism with the loss of efficiency which this entails. In general, manshifts grow more valuable to the mining industry as full employment intensifies.

The fifth cost, which is one not often highlighted, is a loss of respect for the leadership of the officials in charge when an accident, causing more than minor injury, occurs.

Besides all these, accidents causing lost time injuries reduce the standard of living of the miner and his family by lowering their average annual earnings.

But it is fair to say that these costs do not go unnoticed, and there is increasing interest in more novel methods to encourage accident prevention in many coalfields. And though divisional campaigns are few in number, certain Areas and groups and, indeed, many collieries, are trying out new ideas on their own. Nothing in this paper is intended to deter them, as a divisional campaign is really only the central co-ordination of campaigns directed by the Area general manager, the group manager, and the colliery manager. The main object of this paper is rather to encourage effort at all levels.

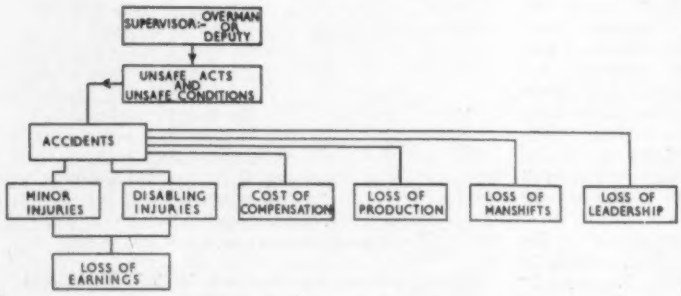


FIG. 2.—COSTS OF ACCIDENTS.

## CAMPAIGNS OF THE PAST

Campaigns for greater safety in the coal-mining industry, of the kind to be discussed, originated in the United States. There, in the 1920s, a number of the larger and more efficient companies began creating safety organizations to inspire their supervisory staff and labour force. Generally, they were headed by a safety engineer with coal production experience who reported directly to the company vice-president (operations). It was the author's good fortune to study some of these organizations during a visit in 1934. Notable among them at the time was that of the Union Pacific Coal Company in the State of Wyoming, which was inspired by Eugene McAuliffe and George Pryde, respectively president and vice-president of that company—two men of great ability and personality with a high regard for human values. Their campaign was then producing phenomenal results—several of their mines, employing 300 to 400 men underground, had worked at a high rate of productivity without a lost time accident during a whole calendar year. "Accidents need not happen" was the simple text adopted by McAuliffe and Pryde for their campaign, which produced safety results year after year in direct contrast to the national record of coal mining in the United States.

The mines of the Union

Pacific Coal Company were entered in the Federal Bureau of Mines national safety competition, and it was quite usual to find one of them in the annual list of winners of a sentinels of safety trophy—the highest safety award in the mining industry of the United States.

Following this visit in 1934, a minor campaign was begun in the author's group of four small collieries in West Fife belonging to The Fife Coal Company, Limited. Within a few months, with the active support which was given by the colliery managers concerned and the company's only safety inspector, the incidence of injury was reduced, and it was evident that a major safety campaign on American lines in the whole of the company's collieries was justified. As a result, the company in 1935 set up a safety and education department in charge of the late Dr. J. N. Williamson as safety engineer. Dr. Williamson was a qualified mining engineer with sound practical and teaching experience. Under his guidance the campaign was developed and the educational side expanded, and in 1939 the International Labour Office in Geneva described the Fife Coal campaign as "the most comprehensive that has come to the knowledge of the office."

Practical action on the job remained the most important feature of the campaign and a competitive spirit was engendered between collieries. Accident injury frequency in deputies' districts was compared so that small groups of men could become interested. For each man, a record of employment card was kept at the colliery where he was currently employed. His experience and attainments were noted on this card as well as time lost due to injuries, and it became a matter of individual pride to maintain a clear compensable injury record.

The early experience of this campaign under Dr. Williamson was described in Volumes XXXIII and XXXVI of the Transactions of the National Association of Colliery Managers and in Volume 96 and later in Volume 106 of the Transactions of the Institution of Mining Engineers.

In the years to vesting date, the campaign of The Fife Coal Company was continued unceasingly, despite the various distractions of the war years which had their effect. Setbacks were, of course,

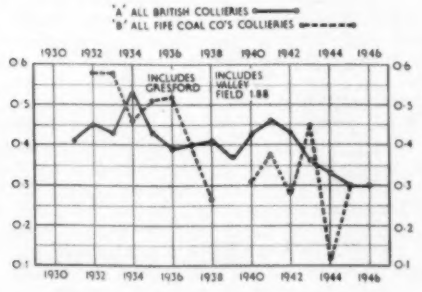


FIG. 3.—FATAL INJURIES PER 100,000 MANSHIFTS, ALL BRITISH COLLIERIES AND ALL FIFE COAL COMPANY COLLIERIES.

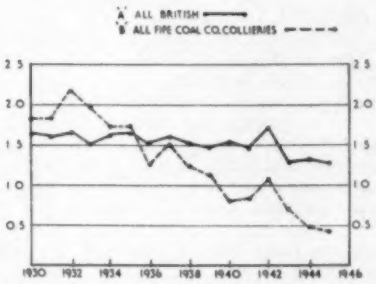


FIG. 4.—NON-FATAL REPORTABLE INJURIES PER 100,000 MANSHIFTS WORKED, ALL BRITISH COLLIERIES AND ALL FIFE COAL COMPANY COLLIERIES.

encountered, particularly the disaster at Valleyfield Colliery in 1939. But the fact remains that the company's campaign for greater safety under the inspired leadership of Dr. J. N. Williamson was the means of saving lives and of preventing much suffering and misery, as can be clearly seen from fatal, reportable non-fatal, and overall frequency records shown in Figs. 3, 4, and 5.

Noteworthy in Fig. 5 is the year 1939, when the company's overall frequency, including industrial diseases, fell to below 20 per 100,000 manshifts. As an individual colliery record, that of Randolph Colliery at 1.99 per 100,000 manshifts in 1940 compared with a figure of 69.05 for Great Britain is perhaps quite unique.

If they did nothing else, the safety campaigns of the Union Pacific Coal Company and The Fife Coal Company proved that where extraordinary means are accepted and used, extraordinary results can be obtained.

## WHAT IS A SAFETY CAMPAIGN?

You may ask what is a safety campaign? It may be defined as "a sustained endeavour to create a conscious effort for accident prevention by both management and men at all times." No doubt you will point out that this is just what you are doing in your daily work with or without a full-scale campaign to back you. But are you taking the matter far enough? For instance, do you accept the following three fundamental concepts which make a safety campaign successful?

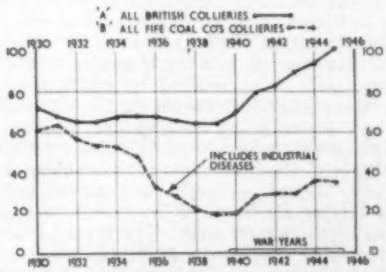


FIG. 5.—INJURY RATE FOR ALL ACCIDENTS PER 100,000 MANSHIFTS, ALL BRITISH COLLIERIES AND ALL FIFE COAL COMPANY COLLIERIES.

(*a*) Accidents are caused.
(*b*) Action must be taken to control accidents.
(*c*) The same type of accident will recur, if no corrective action is taken.

Only if you accept these concepts wholeheartedly will your leadership for greater safety be bold enough. And how are you going to convey these ideas in practical form through your under-officials to your workmen on the job? This is where a well planned campaign plays its part, as will be seen later.

There are three distinct facets of a safety campaign. The first and by far the most important is practical action at the colliery for accident control. The second is education and training in varying forms to raise the standard of safe leadership of the officials and of safe working of the men. The third and least important of the three is publicity in support of practical action. More will be said about each of these later.

In addition, there are four main definitions worth noting.

An accident is "an unplanned, uncontrolled, and an undesirable event or sudden mishap which interrupts an activity or function." On the other hand, an injury is "a bodily hurt received as the result of an accident."

From these two definitions, it will be seen that the same accident may recur nine times without causing an injury, as in the case of a heavy object falling clear on to the ground, but at the tenth time the fall may result in serious injury. In contrast, accidents due to failure to isolate electrical apparatus rarely occur without personal and sometimes serious hurt.

The other two main definitions are as follow:—

An unsafe act is "a departure from an accepted normal or correct procedure or practice, an unnecessary exposure to a hazard or conduct minimizing the degree of safety normally present."

An unsafe condition is "any physical condition which, left uncorrected, may lead to an accident."

Unsafe acts and unsafe conditions are the causes of accidents either independently or in combination. This should be kept in mind, as should the difference between an accident and the injury which may result from it.

## A CAMPAIGN FOR GREATER SAFETY

Whether the safety campaign is to be organized on a divisional, Area, or colliery basis, the ground must be prepared for its reception. It would be a mistake to launch a comprehensive campaign by a single step in a coalfield to which the idea is new. Experience has shown that a first beginning can best be made by seeking the support of the officials down to deputy and shotfirer. This can be done through the leadership of the colliery manager in giving special emphasis to practical action for safety during his frequent inspections both on the surface and underground. The introduction of a selected item for action during each month is a logical second step, and this may be accompanied by an appropriate poster. Again, from experience, the indiscriminate use of slogans in beginning a campaign only plays into the hands of the cynics unfortunately to be found among both management and men. After all, it is practical action on the job and the acceptance of the idea that time spent on practical action is worthwhile, which form the basis of accident prevention.

When the way has been prepared, the fuller campaign may first be launched in discussion within the consultative machine so that the objects are understood and supported. The importance of creating an atmosphere for the acceptance of a safety campaign by officials and union leaders will be appreciated.

This is just what happened when a campaign for greater safety, based on that of The Fife Coal Company, Limited, was inaugurated some three years ago in the Durham Division of the National Coal Board. The notes which follow are mainly descriptive of the scope of this campaign, but with the co-operation of other divisions, certain supplementary information is included. This is gratefully acknowledged.

At the outset, the divisional board took the lead by increasing its interest in individual serious accidents and in accident injury frequency. The production director gave the staff of his safety branch every encouragement by creating safety committees at division and Area, appointing specialist engineers as members, and selecting special subjects for action. Through the divisional consultative council, the unions were brought into the picture and, when it was judged opportune, a comprehensive paper describing a possible campaign was laid before them. It was then agreed to circulate "Notes on a Campaign for Greater Safety" as a guide to all

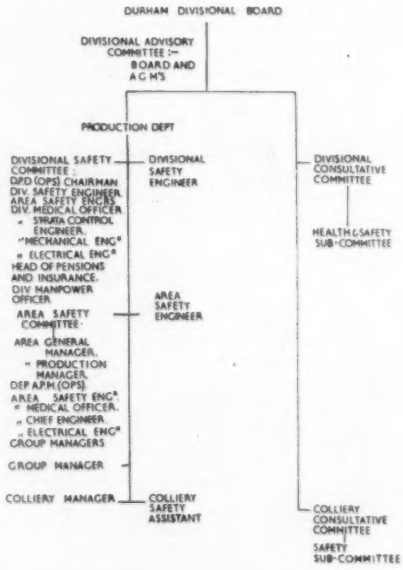
DURHAM DIVISIONAL BOARD
DIVISIONAL ADVISORY COMMITTEE :— BOARD AND A.G.M'S
PRODUCTION DEPT
DIVISIONAL SAFETY COMMITTEE :— D/P.D. (OPS) CHAIRMAN DIV. SAFETY ENGINEER AREA SAFETY ENG'RS. DIV. MEDICAL OFFICER " STRATA CONTROL ENGINEER. "MECHANICAL ENG" " ELECTRICAL ENG" HEAD OF PENSIONS AND INSURANCE. DIV. MANPOWER OFFICER
DIVISIONAL SAFETY ENGINEER
DIVISIONAL CONSULTATIVE COMMITTEE
HEALTH & SAFETY SUB-COMMITTEE
AREA SAFETY COMMITTEE :— AREA GENERAL MANAGER. " PRODUCTION MANAGER. DEP. A.P.M. (OPS). AREA SAFETY ENG" " MEDICAL OFFICER. " CHIEF ENGINEER. " ELECTRICAL ENG" GROUP MANAGERS
AREA SAFETY ENGINEER
GROUP MANAGER
COLLIERY MANAGER
COLLIERY SAFETY ASSISTANT
COLLIERY CONSULTATIVE COMMITTEE
SAFETY SUB-COMMITTEE

FIG. 6.—SAFETY ORGANIZATION, DURHAM DIVISION, NATIONAL COAL BOARD.

members of colliery consultative committees. The campaign was under way.

### The Safety Organization

In Durham, where the campaign is organized throughout the division (Fig. 6), there are three major levels of authority, division, Area, and colliery, with experienced safety officers at each whose task is to foster the campaign and who work in close association with the medical service. But in no sense do they reduce the legal and moral responsibility of line management, particularly of group and colliery managers, for the safe conduct of operations.

At division, the divisional board makes the major policy decisions and maintains constant interest through reports and statistics presented regularly to it. Higher management consultation on safety campaigning is provided through the regular monthly meetings of the divisional advisory committee, of which both board members and Area general managers are members. The task of the Divisional Safety Committee is to ensure the exchange of ideas and experience between Areas and review results, as well as to stimulate the use of developments in methods and equipment proved successful in other divisions and in foreign countries. Consultation with the unions is conducted through a special Health and Safety Sub-committee of the divisional consultative council as well as through the council itself.

At Area level, the executive leadership of the campaign is in the hands of the Area general manager and his Area safety committee, which includes group managers. In effect, each Area conducts its own campaign, utilizing educational and publicity material common to the division together with some designed for its own particular purposes. There is no formal union consultation at this level.

At each colliery, the manager is responsible for the safety campaign in management consultation with his undermanager, chief engineer, and other production officials, and with his colliery safety officer to look after the detail. Though the responsibility for conducting the safety campaign falls on management, the colliery manager has the help of the colliery consultative committee either as a whole or in sub-committee in discussing safety action at a regular monthly meeting.

A sample agenda for this meeting is as follows: 1.—Minutes. 2.—Matters arising. 3.—Safety results—monthly and quarterly. 4.—Accident discussion. 5.—Subject for special action. 6.—Tidiness—underground and surface. 7.—Personal safety equipment in use. 8.—Safety suggestions. 9.—New regulations. 10.—Safety publicity.

A close liaison is maintained at all times with HM Divisional Inspector and his staff, who are kept well informed of the campaign as it proceeds. Adequate contact was also made at an early stage with the Purchasing and Stores Department, and the divisional controller attends the divisional safety committee meetings from time to time.

### Accident Control—Practical Action

The major emphasis in any successful campaign for greater safety must be on the practical steps taken for accident control. Indeed, it is fundamental that the supervisor, the overman, and deputy should be induced to feel a personal responsibility for its success. Their task, with the support of the manager and other senior colliery officials, is to minimize unsafe working conditions and eliminate unsafe acts in their district.

But this can be made easier if sufficient thought is given to accident prevention at the planning and design stage when layout and equipment are determined. Frequently, not enough thought is given to the detail of layout. This applies especially to the transport of coal, stone, and materials, and often results in a demand for manual dexterity beyond the average in practice. The achievement of safe operation depends on simplicity of layout and correct installation of suitable equipment with adequate capacity, and it is probably true to say that the more efficient a layout is in respect of manpower the safer it can be made in operation.

Mining conditions, of course, add their complications. Changing gradient, faulting, thinning of seams, and the like, with the ever-present strata convergence which tends to reduce the size of clearances on roadways and elsewhere, may require subsequent alteration of plans and layout. But careful planning and foresight can minimize their effects to a considerable degree. Furthermore, difficult mining conditions in themselves are no good reason for a lack of accident control.

Routine inspection, followed at the earliest possible moment by remedial action, are the essence of accident control. The statutory inspections form the basis of regular examinations, and no matter how large is his colliery, the manager must see that the deputies' reports are adequately questioned and used for action in order to ensure compliance with the Act and regulations and the board's directives.

Additional regular safety inspections have been instituted in four different forms. The first of these is associated with the subject chosen for special action during the month. This selected subject is made widely known throughout the colliery and the manager and his senior colliery officials make special inspections with it obviously uppermost in mind.

The second is a regular inspection of all safety devices on a planned time schedule in addition to the statutory inspections required of the engineering staff. This is part of the duty of the colliery safety officer.

The third is a quarterly lighting survey, both on the surface and underground, by the colliery electrical engineer.

The fourth form of inspection is in effect an extension of the duty placed on senior colliery management to inspect on shifts other than the main producing one so that all shifts have adequate senior safety supervision.

It will be noticed that all special inspections are not made the responsibility of the colliery safety officer, though he shares in them.

Inspections on behalf of workmen, though normally confined to the revelation of unsafe conditions, can also be directed to the elimination of unsafe acts and bad practices. Workmen's inspec-

tors will co-operate if they are made to feel that their work is appreciated by management.

A more recent innovation is the study of job hazards. As a beginning, a study has been made of the new hazards associated with the plough, the trepanner, and self-advancing supports. These studies are intended to show colliery safety officers how to study the hazards of any job and record them for remedial and instructional purposes.

A high standard of tidiness is also an essential basis for low accident injury frequency. Surface tidiness competitions have been held for three years in Durham in which independent judges recommend the award of trophies on an Area and divisional basis. A points system is adopted in which the relative facilities for tidiness as between unreconstructed collieries and others is taken into account. These competitions have separate classes for small, medium, and large collieries. A similar competition on an Area basis has been held for underground districts, with the colliery manager or a small sub-committee of his consultative committee choosing the best district at each colliery.

With the encouragement given, safety devices in wide variety have emerged, particularly in the East Midlands. Reliability and ease of application are essential features in their design, but too often they are only the subject of local enthusiasm and of adequate maintenance at the outset. Some screening and approval of safety devices, as in the case of forepoling clamps at roadheads, is becoming a necessity.

There are, of course, other useful ideas for accident control. For example, in one Area of the Scottish Division a system of condition rating is being tried to help set safety standards, and in the West Midlands Division a large-scale accident location plan is used at colliery consultative meetings to focus attention visually on accident black spots.

Action for accident control is the keynote of any safety campaign.

### Education and Training

Greater safety comes partly from a change in the attitude of mind. Safety education helps to bring this change and can be used in many different forms.

Safety leaflets and standard instruction cards of a practical nature for issuing to various grades of workmen have proved useful, but require to be followed up on the job. Besides these, leaflets for the use of overmen, deputies, and shotfirers, dealing with parts of the Mines and Quarries Act, have proved most helpful. In addition, separate booklets have been prepared for the use of colliery safety officers, shotfirers, electricians, and underground locomotive drivers.

The North-Western Division has issued a booklet on "Safe Practice in Using Armoured Flexible Conveyors," and the North-Eastern Division one on "Dust"; both have been copied by the Durham Division.

In the North-Western Division, a safety calendar has been issued for a number of years and a first experiment in this direction was made in Durham this year.

While the Royal Society for the Prevention of Accidents does not provide a mining service, some of its material can be used both in the educational and publicity fields, and this source of assistance should not be neglected.

Courses and lectures are being conducted for an increasing number of junior officials. In addition to the normal refresher courses for deputies, some 550 undermanagers and overmen have been given a course in Durham on strata control, with special emphasis on the safety aspects. But the training of the junior official may yet go much further.

For a number of years, each Area in Durham has had a mining technical society to provide opportunity for discussion by colliery officials, and many of their meetings deal with safety in its practical application, sometimes with the help of a film. The Durham Division and the Areas organize essay competitions with a safety subject in association with these societies.

The use of film as an educational medium for safety is still in its infancy in most divisions. The new Safety in Mines Research Establishment film on methane explosions has created widespread interest in the Durham mining communities where it has been shown; and in the South-Western Division, film strips for use at consultative committee meetings have been made on the circumstances leading to 50 typical accidents, showing the right and wrong ways of doing a job.

Practical competitions of various kinds have also proved worthwhile from the educative point of view. Examples of these are the shotfiring and mine rescue competitions held in the Scottish Division and elsewhere, and the well-established first-aid competitions.

In several Areas, good mining practice is being recorded by photographs on the face, on roadways, and elsewhere at the colliery. The names of the workmen responsible for the good work are shown on these photographs when displayed at the pithead and in the local Press. This venture has aroused considerable interest and is worthy of development.

There has been a major extension of practical training in recent years. It should make a real contribution to accident prevention, largely through better quality of workmanship, provided the training is regarded by supervisors and trainees alike as a serious basic preparation, whether it is preliminary or coal-face training. In the case of preliminary training, the safety awareness created in the training gallery and classroom will be quickly dissipated if the young trainee proceeds to regular underground work without some careful handling both by the supervising workman and by the training officer. The latter should be thoroughly conversant with the atmosphere and scope of the training centre. Coal-face training is really only a first step towards acquiring the skill and experience required of the top-grade faceworker; and it is vital that it be so considered by both officials and the older faceworkers.

For some time after training, the young faceworker must continue to be given attention by management and by his fellows, especially where physical conditions are abnormal.

The experienced faceworker himself should not be omitted from the influence of education and training. His co-operation in applying safe methods of working is being sought through a scheme of short talks by the deputy at his station. This scheme is gradually spreading throughout the division, and practical notes or briefs are usually provided for the deputy by higher management, though in one case at least a comprehensive set of notes has been provided by a colliery manager for his own deputies.

In the near future, Area safety exhibitions will be organized, following the East Midlands example. These will include safety equipment, safety devices, and educational matter, and the womenfolk will be invited to attend.

A greater contribution should be made to greater safety through education and training as time goes on.

**Publicity**

Unless steps are taken at the colliery to publicize the fact that management and trade unions are interested in greater safety, some of the benefit of practical action will be lost. Publicity by itself, of course, is of no real value. On the other hand, associated with practical action and education and training, it can be of considerable assistance in impressing in the minds of all employed at the colliery the need for personal care.

Publicity can take many forms, but it requires changing periodically to maintain its value. The semi-permanent slogan makes little impact, as it soon becomes commonplace and is a very elementary beginning to good publicity. Posters should also be changed frequently, even those with an educational element, and the old ones entirely removed. One poster feature should be displayed for a short period at numerous places rather than several at one time. Posters must be simple and easily understood, neither cynical nor gruesome. They should have most point when linked with the current practical action being taken in the colliery; but when associating the family with holiday seasons such as Christmas they are effective too. Professional assistance in poster making is essential.

For poster and safety notice display purposes, a standard noticeboard is available at all collieries in the Scottish Division. This has the advantage of becoming a focal point of interest, but it must be kept attractive and up to date.

Publicity devices are part and parcel of everyday advertising and can be made to "sell" safety in the early stages of safety campaigning. But, as with posters, constant change should be arranged. Flashing signs are readily installed at critical places both on the surface and underground. Safety mirrors to mirror the man who is responsible for his own safety can be varied in position between the colliery entrance and the shaft. The safety shop window can be used to display the latest in personal safety equipment as well as safety models illustrating good practice, but the display must be properly rearranged periodically to excite curiosity.

One of the problems of any campaign is to publicize the safety results in a form simple enough to be widely understood with interest. A device now used at all collieries in Durham consists of a painted board designed to hold wooden strips each bearing the name of a colliery in the Area and fitted so that each strip is set alongside one of a sequence of numbers starting from one at the top in descending order. The overall accident injury rate is used on a cumulative basis and the strips are moved monthly to coincide with the manager's league table.

In this way the officials and men at any colliery can readily see its position relative to other collieries in the league.

Broadcasting for safety purposes also has been the subject of some experimental work on the surface, but with mixed results. A surface loudspeaker system is used with a tape recorder suited to the repetition of short messages on the manway between the baths and the shaft.

In quite another direction, publicity is being used in Durham to create family interest. At the end of each quarter of the year, a lottery is held in which the names of men who are compensable injury free in the period and who make over 75 per cent. attendance are included. Fifty major prizes and 500 Premium Bonds are divided among the 20 colliery groups broadly according to manpower. Each group holds its own draw locally within a few days after the end of the quarter, at a mixed social function. The major prizes have consisted of an all-expenses-paid trip for two to London on Cup Final weekend, a weekend for two to see the lights at Blackpool, and consumer goods to the value of over £20 from the electricity and gas showrooms. An additional special prize of a Ford Anglia was drawn from among the major prizewinners at the end of last year, arousing widespread interest.

The social function is important to any campaign, particularly with the womenfolk present. Each Area holds its annual safety dinner early in the year at which the competition trophies are presented. Similar functions are held at some group and colliery levels with considerable success. Such occasions give management and trade unions a joint opportunity to impress on all that accidents in coal mining are not inevitable and that the use of personal safety equipment at work is sensible and beneath no man's dignity.

It is noteworthy that the total cost of publicity in Durham, including all prizes, is less than ½d. per man per week, which is a much smaller sum than that spent on extra practical action on the job.

It should not be forgotten, however, that all the publicity in the world will fall flat if current practical action in the colliery does not indicate the management's sincere desire to reduce accidents.

It goes without saying that every encouragement should be given to the use of personal safety equipment in the industry.

For many years, industrial safety equipment has been available to minimize the injury effects of accidents. But there has been little improvement in design in recent years.

Leather safety boots of British Standard specification are relatively comfortable, but do not stand up too well to wet conditions, and there has been a move in some coalfields towards the use of unprotected rubber wellington boots, which are an accident menace. To counteract this trend, widespread successful trials have been made in Durham Division of experimental rubber safety boots of ankle, calf, and knee length, though the last length requires further changes in design. These rubber boots are both sold, and issued free and on loan in place of wellingtons, which are being eliminated with union agreement.

Safety hats, too, have been the subject of recent developments. For thin-seam working, a band has been added to the back of the hat to prevent its slipping off when the wearer is in a crouching position. But there is still a critical defect in most safety hats in that they are weakly resistant to a side blow. Reinforcement to the side of the hat is expensive to apply, but it can be achieved, and the cost should be reduced in bulk manufacture.

The use of coloured safety hats to distinguish different categories of personnel—a logical development—is increasing in some industries. The Scottish Division, for example, has begun this practice by issuing yellow hats to juvenile trainees.

Hand injuries form a substantial proportion of all injuries. As the result of a special investigation by the divisional medical service during the month of September, 1959, it was found that out of a total of 4,711 hand injuries in Durham, gloves were not worn in 95 per cent. of the cases. Over 55 per cent. of the surface hand injuries were to craftsmen, 45 per cent. of the underground hand injuries were to hewers and stonemen, and over 60 per cent. of all hand injuries were lacerations against which gloves would have given protection. A further point to note was that more than three days' work was lost by only one in five of glove wearers who sustained an injury, as opposed to two in every three non-glove wearers. But safety and normal industrial gloves are increasing in use and a series of safety gloves for special purposes and industrial gloves for normal working use has been selected after trials in a variety of jobs.

In thin-seam mining, arm injuries are fairly numerous and a sleeve guard suitable for use at the face has been designed and is on trial.

Kneepads, too, have had attention. A better quality giving more protection against beat knee has been devised, and certain unsuitable types have been withdrawn from sale.

In common with other divisions, unsplinterable glasses are issued to mineworkers in Durham who suffer from a certain degree of defective vision, all applications being scrutinized by the divisional medical officer. It is worthy of note that the need of certain categories of workmen for eye protection is much greater than that of others. For instance, blacksmiths are recorded as having an incidence of foreign bodies in the eye 10 times greater than men in any other mining occupation.

There are, therefore, two objects to be achieved by the wearing of glasses. The first is the provision of better sight by the use of prescription lenses which will not break and injure the wearer. The second is the protection of the eye from injury by impact of foreign bodies. Recently, it has been suggested that it is technically possible to prescribe the largest of the standard lenses to give greater eye protection, and research on these lines is now proceeding in the Durham Division. In addition, it would seem that the American practice of providing industrial glasses wherever eye protection is needed should be followed.

### Duties of the Safety Branch

As has been said earlier, the staff of the Safety Branch cannot assume the statutory and moral responsibility which lies fairly and squarely on line management. They are advisory rather than executive in authority, but the advice of a capable and experienced safety officer is not lightly cast aside at any level.

The development of the Safety Branch suffered in the early days of nationalization, and still does today, from the fact that safety work became the refuge for some misfits to the disadvantage of the branch as a whole and to the capable men in it. The latter rightly see in this sphere a means of worthwhile service to the industry. But times are changing, and the safety officer is being chosen for his ability and special qualities to carry out what is a dedicated and relentless task, but a rewarding one.

At colliery level, the safety officer must spend the greatest proportion of his time in making inspections and in discussion on the job. He should be removed from the common role of chief guide for visitors, as he presently is at some collieries. In addition, the statistical load for which he is not generally suited should be largely taken from his shoulders. He must be keenly observant and capable of making concise reports on what he sees, and be, indeed, the manager's safety assistant.

Although the term "colliery safety officer" is used in this paper, it may be noted that such persons are known as "safety assistants" in the Durham Division. It can be readily argued that everyone who supervises colliery operations from the director-general downwards is a "safety officer." This includes the manager, who has a safety assistant as the chief aide in this part of his work.

To guide him in his duties and to remove some of the freelance element in his work, the North-Eastern Division has developed a "Planned Safety Scheme" by which the safety officer carries out specific tasks at periodic intervals and, under the eye of his Area safety engineer, makes reports to his manager. This kind of scheme is being followed by other divisions with advantage.

At Area level, the Area safety engineer requires to be a man of some inspiration and tact, capable of gaining the confidence of the group and colliery managers in his Area. In his case, clerical assistance is necessary to permit him to make frequent under-

ground inspections on behalf of the managers of his Area and to supervise, in a technical sense, the work of the colliery safety officers. His standards must be high and his sense of duty equally so if he is to inspire the whole Area from the safety point of view.

The supervision of colliery safety officers by the Area safety officer is a vital link in the organizational chain. In Durham, in common with some other divisions, there is a regular monthly meeting of colliery safety officers at Area at which experience is exchanged and guidance given.

At division, the divisional safety engineer is the organizer and prime mover of the safety campaign. But he must also make regular underground and surface inspections and so know the facts of mining life. His leadership of the Area safety engineers and his influence with line management must be of a high order. At the same time, he must have initiative and the ability to bring new ideas before higher authority for its active support. A safety campaign depends on the introduction of new thought and action for its success, and much depends on how earnestly higher line management can be made to believe that accidents are caused and that they don't just happen.

### When Accidents Happen

It is a well-known fact that when an accident occurs causing an injury, even a minor one, first aid must be readily available both underground and on the surface. In this connection, the good work of the St. John Ambulance Brigades, and St. Andrew's Ambulance Association in Scotland, cannot be over stated. Durham is fortunate in its high proportion of officials and men who are interested in ambulance work, and the division has issued a badge of recognition to over 10,000 qualified first-aiders, to be worn at work. The badge carries the emblem of St. John with the words "We give and take care."

At collieries with more than 800 men, medical centres with full-time nursing sisters have been established according to the board directive, and the general standard of ambulance rooms at other collieries has been raised considerably. Every effort is being made to ensure that any injury is reported at the medical centre or ambulance room before the injured workman leaves the colliery. In this way, early treatment can be assured, and at the same time the circumstances of the accident can be investigated immediately to prevent a recurrence.

Injury cases requiring treatment in hospital are being visited there by representatives of line management in some Areas as soon after admission as is permissible. In addition, every sick and injured employee of the board in Durham who is in hospital at Christmas time is seen by senior officials and presented with a useful gift parcel with the good wishes of the division. These attentions make the workmen feel they are being remembered and not just discarded when not available for service.

The investigation of accidents, whether they are the cause of injury or not, is a vital factor in accident control, and, as part of the national scheme, an extra safety officer of senior ranking has been appointed at three collieries to investigate individual accident cases with a view to finding means to prevent recurrence. It is too early to say what effect these officers have had on the accident injury frequency.

In the Northern (N & C) Division it has become the custom in selected cases to issue an accident report, with a plan, to Area production managers and group managers for discussion at manager level. There is much to be said for this practice.

When a fatal accident does occur in the Durham Division, the Area concerned holds a private and formal technical inquiry within 48 hours of the occurrence. The circumstances are fully and frankly discussed, and a report is forwarded to division stating the practical measures to be taken to prevent a repetition.

### Statistics and Analysis

The maintenance of safety statistics and their analyses should provide information to build the injury record of the individual workman and the safety record of the official, and to direct attention to injury recurrence so that preventative measures can be taken. General safety progress is also measured by statistical means.

From past experience, there is considerable merit in maintaining the injury record of each workman on a card, so that over a period of years his history is readily available. Such cards are in use in the Durham Division and no great clerical difficulties have been encountered.

The safety records of districts supervised by individual officials also are a necessary part of safety statistics, but there are sometimes difficulties in identifying deputies' responsibilities in this respect. At some collieries, the necessary clerical effort is made and found to be worthwhile. Much depends on the colliery organization, but statistics for overmen's districts should at least be available for this purpose, though the districts may be as large as a small colliery in labour force. The colliery record can also be readily divided between the undermanagers' districts and the surface, but the responsibility for the latter may not be clear cut. It is desirable to compare on a competitive basis the safety performance of the smallest group of men possible, and however the underground manshifts grouping is done, it should be such as to

TABLE 1.—*Managers' League Table, No. 6 Area, Durham Division, January-December, 1960.*

| Position. | Colliery. | Manager. | Injuries per 100,000 man-shifts. | Improvement (−) retrogression (+) on 1959. |
|---|---|---|---|---|
| 1 | Bradley Drift | S. B. Rochester | 63.27 | + 5.55 |
| 2 | Victoria Garesfield | A. Stewart .. | 67.69 | − 42.79 |
| 3 | Barlow Drift .. | A. Hawthornthwaite | 68.48 | − 6.31 |
| 4 | Marley Hill .. | J. W. Morton .. | 69.69 | −102.26 |
| 5 | Hamsterley .. | A. Williams .. | 72.51 | − 25.73 |
| | Area .. .. | | 103.91 | − 17.74 |

TABLE 2.—*Durham Division Injuries.*

| Areas in order of merit. No. | Injuries. Fatal. | Serious reportable | Others over three days' incapacity. | Total injury rate per 100 000 manshifts. 1960. | 1959. |
|---|---|---|---|---|---|
| 6 | 5 | 22 | 4,135 | 103.91 | 121.65 |
| 5 | 2 | 20 | 2,862 | 108.45 | 115.14 |
| 1 | 5 | 37 | 3,733 | 115.08 | 95.55 |
| 4 | 1 | 43 | 4,324 | 132.75 | 138.56 |
| 3 | 3 | 19 | 4,993 | 157.72 | 182.59 |
| 2 | 14 | 44 | 7,733 | 179.00 | 190.17 |
| Division | 30 | 185 | 27,780 | 134.79 | 142.92 |

cover the sphere of authority of the individual official, so that his sense of personal responsibility can be developed.

From experience and despite the official method, accident frequency for colliery level purposes is best conveyed on a manshifts per accident basis, though for group, Area, and division, the normal basis of accidents per 100,000 manshifts should be maintained.

A league table for managers in an Area (Table 1) is kept monthly and is not without its incentive, as is the Area general manager's league table (Table 2), which in total shows the divisional position.

At Area and divisional levels injury frequency is analysed under the main headings, "Character of Accidents" and "Nature of Injuries." Character of accident analysis provides a general indication of the most fruitful direction for preventative effort, though, of course, local management should be taking the necessary action as injuries occur.

An analysis of the follow up of the 1958 reportable non-fatal accidents in the falls of ground category was made in Durham in September, 1960. This revealed that one third of the injured men did not return to work at all, one third returned to alternative work, and only one third to their own work. This re-emphasizes the importance of the prevention of injuries due to falls of ground.

Nature of injury analysis is also of service in relation to personal safety equipment. Periodicity of absence severity is recorded, but so many outside factors affect the minor cases that it has lost some of its value in assessing progress. Time of injury during the shift and other detailed statistical records have not yet proved of much service.

A regular quarterly census of safety hats and boots in use is, however, worth the effort and can be used to gain union support for the extended use of these protectives. Later, gloves and other items of personal equipment may be similarly recorded.

Some uncertainty as to the accuracy of the actual number of non-reportable accident injuries has arisen following the change made under the National Insurance (Industrial Injuries) Act in 1948, when the employer was relieved of paying compensation directly to the injured. Efforts to arrange with the Ministry of Pensions and National Insurance to have a regular cross check with it have not yet proved successful. It is known that cases do occur where absence of over three days due to injury is alleged, the absence is condoned, and no injury benefit is claimed. On the other hand, some compensable injury cases may be omitted from the statistics, although in the Durham Division a special check is made by the Finance Department through B.I.76 forms returnable to the Ministry of National Insurance.

### Local Campaigns

No campaign, whether on a divisional or an Area basis, should remove initiative from colliery level. And provided no precedent is set in wages and conditions and matters directly associated, a colliery manager should feel free to have his own local campaign.

For instance, at one of the older collieries in the Durham Division the manager and his consultative committee have made such special efforts that the overall frequency rate has been reduced by 18 per cent. in two years under difficult working conditions. The standard of leadership and work done at this colliery is rising, and industrial relations could hardly be better.

By various means, the committee has acquired a silver cup for the overman with the best record and one for the corresponding deputy. In addition, there are two small cups for two workmen with an accident-free record during the year which are awarded as the result of a lottery. Besides these, the committee holds its own draw from among the compensable injury free for Premium Bonds which the committee finances itself. To mark the completion of the safety year a very large mixed social evening is held where the lessons of the year are reported by the manager and the union representatives together.

Though the effort at this colliery is not unique, nor are the safety results outstandingly good as yet, it is mentioned as a fine example of a local campaign within a divisional one.

### Role of the Medical Examination

The medical examination is a positive and not a negative action. It is positive in that (*a*) it reassures the applicant that he is truly fit for the job he proposes to do and (*b*) it gives the employer some guarantee that the man he employs will be fit for that work and will not endanger either himself or his workmates. It is not a device to skim the cream off the labour force.

The importance of the examination cannot be over-estimated when it is remembered that the boy of 15 who enters mining can expect to serve 50 years in that industry. So the doctor has to project his assessment into the future.

With the passage of time the parts of the human machine start to wear out. When the heart or lungs falter the advice of a doctor is sought. But the gradual deterioration in visual and auditory acuity is not readily appreciated, nor is the imperceptible slowing down of reaction times which may be obvious to a trained observer and which can mean the difference between safety and injury.

Deterioration in vision and hearing occurs so gradually that it may pass unnoticed in the manual worker. Distant vision blurs, keenness of percep-

tion on the periphery so vital at the coal face is lost, and dark adaptation probably deteriorates, too. Hearing is a concomitant problem. Its loss can only be measured accurately by instruments in laboratory conditions. Only in the last decade has it been admitted that noise is a real problem in industry. Of all the five senses hearing is the one that is needed to catch the whisper of a creaking roof, the undertone of the face belts, the rumble of approaching haulage, and the signal and telephone bells which are all so critical to the mineworker.

Perhaps it is time to wonder if it is safe for the older worker to go alone down some of the haulage ways. Does he see what he should see and hear what he should hear? Can he react on the instant to the warning shout? Much of the equipment of a colliery is submitted to the most stringent periodic examinations, *e.g.*, boilers, electrical switchgear. Yet the most complex machine of all, the human body, after an initial examination, runs on uninspected until after an accident injury occurs.

Medical examination on return to work after a long illness is something which both man and manager should ponder seriously in their separate and joint interests.

### Industrial Diseases

The overall accident injury frequency rate does not, of course, include the incidence of industrial diseases, but action to reduce the incidence of the latter is just as important from the "costs" point of view. Considerable progress has been made in dealing with industrial diseases through the work of the board's medical service, which has collaborated in providing the data under this heading.

As is well known, the most serious of industrial diseases in coal mining is pneumoconiosis, but it forms too large a subject to be dealt with here. Suffice it to say that the industry has treated this disease in the serious fashion it deserves.

Next in size is the problem of the beat condition of the knee, the elbow, and the hand, of which beat knee is the major one. Table 3 compares the

TABLE 3.—*Beat Knee Condition.*

| Year. | Durham Division. | | Great Britain. | |
|---|---|---|---|---|
| | New. | Incidence per 1,000 men. | New. | Incidence per 1,000 men. |
| 1952 | 1,165 | 10.89 | 9,118 | 12.76 |
| 1953 | 1,114 | 10.65 | 9,326 | 13.12 |
| 1954 | 1,111 | 10.91 | 9,470 | 13.49 |
| 1955 | 1,157 | 11.37 | 8,928 | 12.80 |
| 1956 | 1,145 | 11.25 | 8,712 | 12.49 |
| 1957 | 1,031 | 10.18 | 7,572 | 10.76 |
| 1958 | 1,053 | 10.59 | 7,863 | 11.35 |
| 1959 | 944 | 9.87 | 7,716 | 11.72 |
| 1960 | 961 | 10.66 | 7,055 | 11.72 |

figures of beat knee for Durham and Great Britain as a whole.

Fundamental research into the problem of beat knee has been done in the Durham and North-Eastern divisions and at Sheffield Royal Infirmary. It is sufficient to indicate that when a 12-stone filler is filling right handed on to a bottom-loading belt with a standard shovel, the downward pressure exerted by his left knee varies, at different points in the cycle, from one to 20 stones (14-280 lb.).

The following criteria must be fulfilled in any knee pad if protection is to be provided: (*a*) It must provide a stable base on which to work; (*b*) it must not, when fastened, impede circulation; (*c*) it must allow the gummings which come over the upper part of the pad to filter out and not to obtrude between pad and knee; (*d*) it must be constructed, in its inner lining, of such a material as will not deteriorate in heat or become sweat-sodden and hardened; (*e*) it must be sturdy.

Collaboration with the manufacturers has produced a knee pad which fulfils the above criteria. Its extended use should materially reduce the incidence of this troublesome condition.

In 1924-5, nystagmus had the second highest incidence of notifiable industrial diseases in the whole country; it is now virtually a thing of the past, as the following figures of certificates of disablement (Great Britain) show:—1939, 12,054; 1947, 851; 1948, 644 (under the Workmen's Compensation Act); 1958, 82; 1959, 76; 1960, 55 (under the National Insurance (Industrial Injuries) Act).

Dermatitis is an important condition, being a chronic one which runs a protracted course causing much time to be lost, but is not more prone to occur in miners than in other industrial workers, although in the coal-mining industry the incidence appears to be rising. Certificates granted under the Workmen's Compensation Act numbered 402 in 1940, 1,650 in 1947, and 1,588 to July 5, 1948. Certificates granted under the National Insurance (Industrial Injuries) Act in 1960 totalled 3,162. The incidence rose in Great Britain from 2.4 per thousand employed in 1946 to 4.2 per thousand employed in 1949.

Work done in the South-Western Division in 1956 showed that 24.3 per cent. occurred on the lower legs, 22.9 per cent. occurred in the groins, thighs, and calves, and 20 per cent. occurred on the hands and fingers. It was also noteworthy that 42.4 per cent. of the men in this survey lost more than three months' work. A further survey reported in 1959 in the same division stated that "the special distribution of the rash corresponded to the areas most exposed to frictional damage at work."

The health of the skin is a most important factor in the pre-employment examination and the young trainees are taught to wash and to care for their skin. Constant thought is given to the provision of adequate washing facilities on pit tops, and in

TABLE 4.—*Dermatitis.*

| Year. | Durham Division. | | Great Britain. | |
|---|---|---|---|---|
| | New. | Incidence per 1,000 men. | New. | Incidence per 1,000 men. |
| 1952 | 643 | 6.01 | 3,863 | 5.40 |
| 1953 | 699 | 6.68 | 4,517 | 6.35 |
| 1954 | 595 | 5.84 | 4,325 | 6.16 |
| 1955 | 493 | 4.85 | 4,101 | 5.88 |
| 1956 | 513 | 5.04 | 4,153 | 5.95 |
| 1957 | 370 | 3.65 | 3,538 | 5.03 |
| 1958 | 358 | 3.60 | 3,762 | 5.43 |
| 1959 | 251 | 2.63 | 3,543 | 5.38 |
| 1960 | 264 | 2.93 | 3,162 | 5.25 |

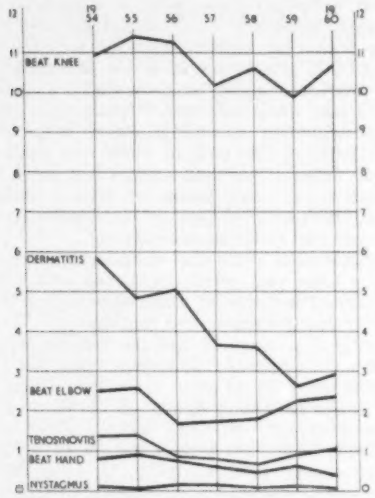


FIG. 7.—INCIDENCE OF INDUSTRIAL DISEASES (INITIAL SPELLS ONLY), DURHAM DIVISION, NATIONAL COAL BOARD. RATE PER 1,000 PERSONS EMPLOYED.

workshops where contact with potentially irritating oils is frequent. The medical service has reviewed the barrier creams and hand cleansers in use and has encouraged the production of simple, strong dispensers in which both can be stored for instant use. The colliery nurses are trained in the daily care of skin cases, and early diagnosis and prompt treatment will lead to cure with no loss of time. Table 4 compares the figures for Durham and Great Britain as a whole.

The recent incidence of industrial diseases in the Durham Division, excluding pneumoconiosis, is shown in Fig. 7, and it will be readily seen that further collaboration between line management and the medical service is needed in Durham, as it no doubt is in other divisions.

### Reviewing Progress

Towards the end of each year, two meetings of colliery consultative representatives with management, HM Inspectors, and the unions are held in the Durham Division to review progress and set out the programme for the coming 12 months. The

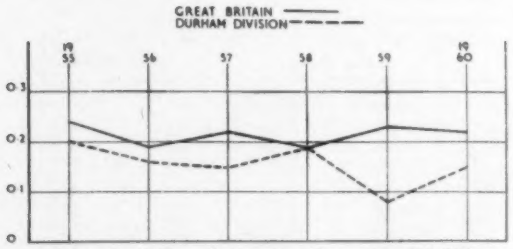


FIG. 8.—FATAL ACCIDENTS RATE PER 100,000 MANSHIFTS.

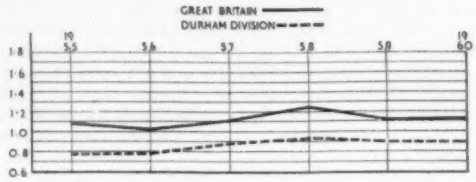


FIG. 9.—NON-FATAL REPORTABLE ACCIDENTS. RATE PER 100,000 MANSHIFTS.

chair has been taken by the general secretary of the Durham Area of the National Union of Mineworkers, and the chairman of the division makes a detailed statement on behalf of the board. This is followed by questions and a frank discussion. A full record of these meetings is printed and issued to all consultative committee members. A statement of action taken on the points raised at the meetings is also distributed a short time after. These larger meetings are followed by special discussions at colliery level where questions are answered and problems are ironed out.

It should be noted that the unions are giving the management wholehearted support at most collieries throughout the county in this joint endeavour for accident prevention.

The Durham campaign has only been in being for just over three years in a period disturbed by recession and the redeployment of manpower in considerable numbers between collieries. The earlier injury frequency records before this were higher than the national ones and at some collieries a pronounced injury complex existed.

In the period of the campaign some progress has been made, though not enough. Figs. 8, 9, and 10 show the fatal, reportable non-fatal, and overall injury rates in recent years compared with the national figures. From Fig. 8 it will be seen that the fatality rate has been reduced. In actual numbers, there were 85 in the two years 1957 and 1958—the best years up to that time—compared with 47 in the two years 1959 and 1960. The frequency rates in these pairs of years was 0.18 and 0.11 per 100,000 manshifts. But reportable non-fatal injuries (Fig. 9) have not yet been greatly affected, though from the medical angle they are less serious. The overall injury rate, shown in Fig. 10, is now lower than the national figure, but it has a long way to go before it even reaches the level of the East Midlands Division. This can be

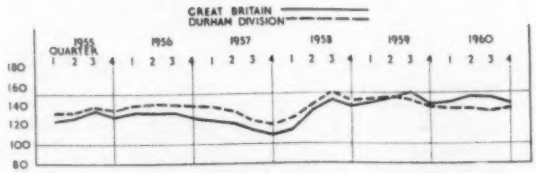


FIG. 10.—INJURY RATE PER 100,000 MANSHIFTS (ALL INJURIES).

TABLE 5.—*Divisional League Table, January-December, 1960.*

| Division. | Fatal. | | Serious reportable injuries. | | Other injuries (reportable or involving absence over three days). | | Rate per 100,000 manshifts (total all accidents). | |
|---|---|---|---|---|---|---|---|---|
| | 1960. | 1959. | 1960. | 1959. | 1960. | 1959. | 1960. | 1959. |
| East Midlands .. | 37 | 22 | 192 | 204 | 18,076 | 18,180 | 86.31 | 82.43 |
| West Midlands .. | 27 | 24 | 119 | 184 | 11,831 | 14,410 | 117.60 | 125.15 |
| North-Western .. | 18 | 38 | 117 | 130 | 12,478 | 14,229 | 125.84 | 125.38 |
| Scottish .. .. | 50 | 95 | 243 | 231 | 21,165 | 20,099 | 132.19 | 114.57 |
| Durham .. .. | 30 | 17 | 185 | 198 | 27,780 | 31,097 | 134.79 | 142.92 |
| North-Eastern .. | 46 | 68 | 263 | 289 | 40,256 | 45,894 | 153.86 | 163.44 |
| Northern (N & C) .. | 21 | 19 | 109 | 107 | 14,793 | 16,006 | 163.96 | 161.87 |
| South-Eastern .. | 3 | 4 | 10 | 6 | 2,497 | 2,661 | 192.21 | 176.90 |
| South-Western .. | 84 | 56 | 315 | 313 | 42,147 | 44,863 | 224.13 | 220.16 |
| All divisions .. | 316 | 343 | 1,553 | 1,662 | 191,023 | 207,439 | 143.70 | 143.84 |

seen from Table 5, which indicates the position in each division and Great Britain as a whole in 1960.

### The Forward Programme

No safety campaign can remain alive without a forward programme. Certain basic items of the campaign must be re-emphasized and new ideas introduced.

For instance, in the Durham Division in 1961 special attention is being devoted to power-loading faces, to handling gear for heavy equipment, and to man-walking ways where men pass both on the surface and underground. Trials are proceeding in the use of 300 safety lamps adapted with a lance developed by Mr. Baker, divisional safety engineer, designed to collect gas samples at a distance.

In the educational field, a simple pamphlet has been produced suitable for juvenile entrants. Standard job instruction cards are also in preparation. A course for colliery safety officers has been undertaken, and a further short course for secretaries of colliery consultative committees on minutes and statistics is being prepared.

Inspection of face training is being intensified during this year from the safety angle. Special attention is also being given to training in work at roadheads, and it may be that where co-operation can be obtained, certain roadheads will be earmarked for study and later reserved for retraining experienced stone workers in safer methods.

In the field of personal protection it has been decided to supply the juvenile entrant with safety boots, hat, industrial gloves, and overalls, free and on loan, immediately he enters the employment of the board, and not at the preliminary training stage, as is the rule. In this way, it is hoped he will realize that personal safety equipment is something to be worn by the miner from the time he enters the service until he leaves it.

Continuous emphasis will be placed on general inspection and immediate remedy as the main basis of accident prevention, especially where mining methods or equipment unfamiliar to a colliery are being introduced.

## CONCLUSION

The need for greater safety in the coal-mining industry has been in the minds of managements and trade unions for many years. Management in its routine daily work has reduced accident injury frequency and severity very considerably, but the current annual record of the industry gives the mining engineer no joy in reading it. Progress is too slow, and it can only be accelerated by extraordinary means. The success achieved by the Union Pacific Coal Company and The Fife Coal Company, Limited, in earlier years has proved quite conclusively that where these extraordinary means have been accepted and used, extraordinary progress has been made.

These notes are written largely as a guide to the Durham safety campaign, which incorporates some unusual features. Many alternative ideas are being applied elsewhere, some of which have been included here, and no claim is made that the practices recorded are alone the right ones.

As one eminent mining engineer has put it: "The campaign and the organization on which it is based must be a means of ensuring that the 'rays' of its inspiration do not fall off as they fan out to a distance from the centre. Rather they must be picked up, amplified, and rebroadcast at each level of authority with ever-increasing potency."

What is mainly required is strength of leadership from the top, a staff of safety engineers and officers inspired and devoted to the task, and a general acceptance by colliery managers that greater safety can be achieved. The problems of hard physical conditions underground, and perhaps of numbers of unbelieving and unresponding officials and workmen, can be overcome in time. There is no short-term answer.

The Durham Division is fortunate in having a good staff of safety engineers, many with initiative and new ideas, all determined to make their campaign a success for the sake of the industry. It is fortunate, too, in having line managements from Area general managers downwards who are willing to give the campaign very real support. And last, but by no means least, the union leaders are convinced that greater safety is social progress, and better than any form of compensation for injury.

Though much remains to be done, and setbacks may be encountered, Durham is determined to make greater safety a reality throughout the county within the shortest possible space of time.

Gone are the days of the "pure" accident. ACCIDENTS ARE CAUSED AND CAN BE PREVENTED.

*[Discussion is reported overleaf]*

## DISCUSSION

MR. JOHN MILLER asked Dr. Reid about the problems of noise and dust in collieries. He spoke also of what he considered to be a valuable by-product of safety measures, namely, improved industrial relations. He had found that proper attention to safety did promote better industrial relations.

DR. REID, in his reply, brought some of the figures in his paper up-to-date. He indicated that in the Durham Division for the five months to the end of May, 1961, there had been seven fatalities with a rate of 0.07 per 100,000 manshifts and 62 reportable non-fatal serious injuries with a rate of 0.75 per 100,000 manshifts. Those figures showed promising progress, he said.

Replying to Mr. Miller's questions, Dr. Reid said that much had been done in regard to dust suppression in the collieries, but he thought that much more could be done to reduce noise.

Safety was a matter which provided a common platform and it was true that if the management could get the men with them they would secure improved industrial relations very quickly.

Replying to another question, Dr. Reid said that the idea of getting the younger people to take part in safety work was a good one. It should serve a useful purpose as an experiment to see how things worked out, and he welcomed it.

MR. ROBERT WILLIAMS said that one of the weaknesses of the safety campaign was that the standard of the pit safety officers was comparatively poor. It was felt that, unless the pit safety officer were of the required standard, he would make no progress and would not give the manager the help that was needed. If Dr. Reid agreed, would he say how that apathy could be reconciled and how they could get the right kind of men at the pits?

DR. REID said that there seemed no doubt that some pit safety officers were not of the quality desired. Consideration had been given to trying to raise the standard. There could be two grades, one being that of the present average safety officer and the other being of a higher grade to include the best of the present officers and new entrants representative of the officer of the future. He felt that something of that kind might well be done. In the West Midlands special safety officers were appointed for investigation purposes, to find out how to get those higher grade safety officers to work with the various other officials in the pits, while not usurping any of their powers. One felt that safety officers should not have executive authority, because if they had such authority they would usurp the authority of the undermanagers. They should make certain that the safety officers worked as part of the team, being at the right hand of the managers on safety matters.

### Kernel of the Problem

MR. T. SMITH said that Dr. Reid's treatise was the best he had read or heard on safety. Not only did it relate the historical development of safety campaigns, but it also gave up-to-date details of the present stages.

Commenting on two points which Dr. Reid had raised, he said that first it was stated that approximately one third of the total labour force employed in the industry changed their places of work every day. The second point was the need to have a very high standard of junior officials.

In his opinion Dr. Reid had struck at the kernel of the whole problem of accident prevention. While management must accept criticism for quite a number of the accidents which occurred, he believed that 95 per cent. of all accidents resulted from some malpractice by a workman or a junior official, and he suggested that the way to solve that problem was to have the proper type of training scheme for the leaders of the vulnerable one third.

There were training schemes for new entrants to the industry, and there were training schemes for engineers, electricians, and surveyors. There were also the direct and practical training scheme for graduates from the universities who were about to enter the mining industry. He asked if Dr. Reid would agree that the time had long since passed for the NCB to initiate an abridged directed practical training scheme for the junior officials of the industry.

DR. REID spoke of what was in effect a proposed directed practical training scheme and at the same time a scheme which would develop a man's management ability both to get work done properly by the workmen in his charge and enable him to negotiate and maintain good industrial relations.

Asked what qualification he would suggest for under-officials in the mining industry today, Dr. Reid said that junior officials were not being trained as they should be trained. He felt certain they should try to select men having a broader knowledge of their fellow men, whose sense of leadership was well developed and who could get the work done. They needed to be given greater knowledge than they already possessed. He was merely saying that mining engineers had not taken the opportunity to select and train the right kind of officials.

MR. C. M. INGLIS, who proposed a vote of thanks to Dr. Reid for his paper, said the association could not have had a man better fitted to present it. He urged that close attention should be paid to publicity, suggesting more exhibitions, meetings, and discussions.

MR. W. DUNCAN, who presided, recalled the good service which Dr. Reid's family had given to the coal industry of this country. Dr. Reid had followed his father into the industry, and was now being hotly pursued by his son. Referring to the exhibition of safety in coal mining, which was held in conjunction with the conference, the chairman mentioned the interest that had been shown in the statuette entitled "Sentinels of Safety" which was on view there. It was the supreme award of the Federal Bureau of Mines of America, and was both beautiful and inspiring.

DR. REID said he hoped that in the coming years the industry would give even more attention to greater safety and that the NACM members would lead in the campaign for the prevention of mining accidents.

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# Imperial College of Science and Technology

PROSPECTUS for 1962-63 of the Imperial College of Science and Technology (Royal College of Science, Royal School of Mines, and the City and Guilds College), University of London, available from the offices of the Registrar at Prince Consort Road, London, S.W.7, without charge, is a valuable guide to the work of each of the three constituent colleges.

Also available is the "Imperial College Calendar," price 5s., post free (cloth 10s.), a volume of nearly 400 pages. It contains a short history of the college, details of the governing body and staff, a full outline of the courses of study available, dates of the various examinations, and a wealth of other information concerning the three constituent colleges.

# ISI Special Meeting

# THREE CENTURIES OF PROGRESS

## in the AMERICAN STEEL INDUSTRY

**In his address at the inaugural session of the special meeting of the Iron and Steel Institute at the United Engineering Centre, New York City, on October 19, Dr. James B. Austin, administrative vice-president, research and technology, United States Steel Corporation, outlined the story of the iron and steel industry in America—how it began and how it has progressed. "I trust that as a result of your tour you will be able to draw your own conclusions as to how it will fare in the future," he said. As reported in our last issue, Sir Charles Goodeve, FRS, president of the ISI, announced at the meeting the election of Dr. Austin as a vice-president of the institute, making him the seventh American to have received this honour.**

## by DR. JAMES B. AUSTIN

AS an introduction I should like to summarize the geography and topography of the United States, because it will enable you to understand better certain phases of the development of the American iron and steel industry. There is a coastal plain extending along virtually the entire eastern seaboard. This is the area which was initially settled and developed. Some hundreds of miles westward, and running roughly parallel to the coast, is a relatively low range of mountains called the Appalachians. There are three summits in this range which have an altitude of over 6,000 ft. (Mt. Mitchell in North Carolina, Clingman's Dome in Tennessee, and Mt. Washington in New Hampshire), but, in general, these mountains fall in the range 3,000 to 5,000 ft. In addition to being a natural barrier to easy westward migration, the Appalachian range is also important because it includes some of the major coal-producing areas of the country.

Still farther to the west lies the great central plain which forms the basis for the Mississippi river and its tributaries. This area is a very productive agricultural region. The great net of inland waterways provided by this river system, together with the Great Lakes to the north, has been, and still is, significant in providing cheap transportation. Still farther to the west beyond the Great Plains lie the Rockies, which are younger and more rugged mountains ranging up to altitudes of over 14,000 ft. These again provided an impediment to expansion westward. Finally, other mountain ranges run along the Pacific coast—and in some cases come virtually to the sea. Individual peaks in these ranges, too, rise to a height of over 14,000 ft.

Iron ore is found widely distributed over the entire country. In earlier days there were, along the eastern coast, a number of occurrences of bog ore in marshy lowlands and these were the source of the iron in colonial times. Today they are of little significance. But in the Appalachian region back from the coast, there are deposits which are still of some importance. Chief among these are the Adirondack deposits in New York State to the north and the iron deposits in Alabama to the south. The former is a magnetite ore, the latter a red ore.

In the central region of the Great Plains, there are other extensive deposits, ranging from Minnesota in the north to Texas in the south. The most notable of these are the great deposits around Lake Superior—the Mesabi, Vermilion, and Gogebic ranges. The Mesabi is perhaps the most spectacular. Here the iron formation was laid down on the bottom of an ancient lake which has since been raised. These deposits were hard iron silicates. As time went on, they faulted and the seepage of water through these cracks leached out over the millions of years much of the silica leaving pockets of high-grade iron oxides which can easily be scooped up in shovels. It is these so-called direct shipping ores, located close to water transport, which nurtured the growth of the American steel industry. And the great reserves of taconite rock still in this region are now becoming of great significance. Going farther to the west again, there are a few notable deposits in the Rockies and in the Pacific coastal area.

Coal is also widely scattered over the country, but the most extensive coal-producing region is along the Appalachian range. In some places, as in eastern Pennsylvania, there is hard anthracite coal, but in the main these deposits contain soft bitum-

inous coal. In one area—Alabama—the coal and ore are found very close together. Other major coalfields lie in the Mississippi Valley area to the west. Finally, there are considerable coal deposits in the Rockies and in the north-western corner of the country.

A map of the distribution of iron and steel works shows that the mills are located chiefly in the eastern—and mainly north-eastern sections of the country—as would be expected in view of the fact that here there is a beneficent combination of ore, coal, and easy transportation. And, of course, this is the most thickly populated area. The seven States of New York, Pennsylvania, Maryland, Ohio, Indiana, Illinois, and Michigan, included on the Iron and Steel Institute's tour, produced in 1960 more than 80 per cent. of the steel made in the United States.

American archeologists generally agree that no metal was smelted in North America in pre-Columbian times. The Indians did, however, beat meteoritic iron into beads, knives, chisels, and drills, though only in very small quantities. The first recorded discovery of iron ore in America was in 1584 when an English expedition sent by Sir Walter Raleigh found a deposite on Roanoke Island off the coast of North Carolina. A mine was found which was reported "to hold iron richly," but apparently none was shipped back to England—probably because these explorers were looking for gold rather than iron.

Some years later, iron ore was discovered near Jamestown in the State of Virginia. In 1609 enough ore was shipped from this area to England to be smelted into some 16 tons of iron as "so good as the East Indian merchants brought it of the Virginian Company preferring it before any other iron of what country so ever." But another decade was to pass before ironmaking in Virginia got a start as the result of a gift of £550 made anonymously by a Londoner, who signed himself "Dust and Ashes." It was offered to the Virginia Company for the purpose of "bringing up of the infidel children in true religion and Christianity."

### The Southampton Adventurers

The Virginia Company, which had been chartered by the Crown to colonize Virginia, was in something of a quandary as to how to use this unusual bequest and at the same time advance its major aim of starting an iron industry. The solution was found by entrusting the money to a group which called itself the Southampton Adventurers and which added on its own "a far greater sum for the furnishing out of Capt. Bluett and his company being 80 very able and sufficient workmen with all manner of provisions for the setting up of an iron work in Virginia, whereof the profit accruing were intended and ordered in a rateable proportion to be faithfully employed for the educating of 30 infidel children in Christian religion and otherwise as the donor had required."

Bluett died shortly after his arrival and what became of the project is not clear, but there are historical references to plans for three ironworks to be set up in the period 1619-20. By May, 1621, the company had spent some £4,000 on ironmaking in Virginia with virtually nothing to show for it. But it did not give up. In that year, Sir Edwin Sandys, Treasurer and chief executive officer of the company, sent John Berkeley, who was reputed to know the iron business, to start again. There were, as might be expected, numerous delays. Berkeley assured the company, however, that good quantities of iron could be expected by Whitsuntide of 1622.

### Indians' Alarm

Meanwhile, the Indians inhabiting the region were looking with suspicion upon the strange activities of the white men, and when the first tests of the furnace were made the smoke and flame apparently filled the warriors with alarm. On March 22, 1622, the day set for the official blow-in of the furnace, the Indians attacked the settlement and massacred the inhabitants. One legend has it that the only survivor of the 348 members of the colony was Berkeley's son, who was away at the time. This disaster ended efforts to make iron in Virginia and a century was to pass before they were revived.

On the other hand, in the State of Massachusetts to the north, things were going rather better. Shortly after the Pilgrims landed in Plymouth in 1620, they discovered bog iron ore. Although this aroused some interest, nothing much was done until about 1642 when John Winthrop, the younger, son of the first Governor of the Massachusetts Bay Colony, organized the Company of Undertakers of the Ironworks in New England, which had a capital of £1,000.

In the winter of 1643-44, the General Court of Massachussetts offered the undertakers a 21-year monopoly in the manufacture of iron, along with grants of land and other privileges on the condition that the undertakers would produce enough iron to meet the colony's needs within two years. These terms were unacceptable to the undertakers, but negotiations lasting several years finally led to a compromise. It is interesting to note that the Court was unyielding on the stipulation that the maximum price for bar iron was to be £20 per ton.

In the autumn of 1643, Winthrop, acting as agent for the undertakers, came to the colony and selected a site at Braintree, south of Boston, on which to build the blast furnace. Construction was completed in 1645 and the first successful blast furnace in North America went into operation. But the ore supply proved disappointing and there was lack of water in certain seasons. Moreover, there were differences of opinion among the undertakers, and Winthrop was replaced by a new agent, Richard Leader, who built a forge for converting the pig-iron from Braintree into wrought-iron—but soon decided he needed a better blast furnace. At Lynn, on the Saugus river between Boston and Salem, he found a happy combination of a plentiful supply of bog ore, extensive woodlands, and a navigable stream that could be dammed above the works to provide water power. This new furnace

was finished in 1648 and the Braintree establishment was abandoned.

The new community was named Hammersmith, although it is known today as the Saugus Works. It was an ambitious project and compared favourably with the most contemporary plants in England. In addition to the blast furnace, which had a 20-ft. stack, there was a 500-lb. tilt hammer, and a rolling and slitting mill—the first equipment of this kind in America. There was an extensive water power system with seven wheels, good storage facilities, a blacksmith's forge, accommodation for workmen, and a pier for small river boats. The property also included a 600-acre farm operated largely by independent Scots.

### Plant Abandoned

In September, 1648, it was reported that "the furnace runnes 8 tun per weeke and their barre iron is as good as Spanish." Production continued for nearly 20 years, but almost from the start there were financial troubles, which finally ended in failure. One obvious cause was that the earlier agents were not experienced ironmasters and the later ones, though technically sound, were poor businessmen. Extensive litigation ensued—both in Massachusetts and in England, and it is said that the matter came before Cromwell himself. The properties gradually fell into disrepair and by 1670 the plant was abandoned.

Some 270 years later, a group in New England formed the First Ironworks Association, Inc., to restore the works as faithfully as it was possible to do so. Specialists of many kinds—archaeologists, historians, architects, metallurgists, and others—combined their skills in recreating what has been called the birthplace of the American iron and steel industry. On September 17, 1954, the restored site was officially dedicated and is now quite a public attraction.

The first successor to the Saugus Works was built in 1656 near Taunton in the Plymouth Colony. It was to remain in operation for 224 years. Other ironworks soon sprang up, but the high-quality bog ore gave out and rather restricted expansion and competition with furnaces in other colonies.

In the early days of the 18th century, there arose a social and economic community which is believed to be unique to the American colonies. It was called the iron plantation. Its origin and growth were based on two factors. The first was the accessibility of both acceptable iron ore and vast stands of timber. A typical blast furnace of the period, producing 2 tons of iron a day consumed the charcoal obtained from about an acre of woodland. In addition, large quantities of charcoal were needed in the associated forges and blacksmith shops, so the woodsmen and charcoal burners far outnumbered the miners and furnace crews.

The second factor was the growth of the early settlements into towns and then cities. Whereas at Saugus production of iron was for limited local consumption, the larger towns now offered expanded and concentrated markets.

The iron plantation was largely a self-sufficient community of almost feudal organization, and was similar in many respects to the cotton plantations in the south. One of the smaller of these iron plantations was located at Valley Forge, but it was destroyed by enemy action during the Revolution. General Washington, who spent a memorable winter at the town of Valley Forge, was then forced to rely for cannon and shot on the Hopewell Village plantation some 20 miles away.

### The Hopewell Plantation

Hopewell, typical of the larger plantations, was started by William Bird in 1770 and at one time had 1,000 inhabitants and covered 10,000 acres. About 600 acres a year of woodland were cut to provide the charcoal needed. In line with the usual pattern, the ironmaster had a sizable mansion, which was, of course, the manor house of the plantation. Cottages for furnacemen, woodcutters, miners, blacksmiths, farm hands, and their families were clustered around the mansion or the furnaces. A farm and vegetable garden supplied the community with food. The plantation had its own grist mill, and sawmill, and a store stocked with medicines, cloth, hardware, and other necessities not provided within the plantation. Since it was a good example of this type of early ironmaking community, Hopewell Village was made a national historic site in 1938 and has been largely reconstructed.

With the rise of the iron plantation and the continued growth of the colonies, there came a spectacular increase in the production of iron. In 1700, the seaboard colonies produced about 1,500 tons of iron. Fifty years later, with the native industry pushing inland and southward, some 10,000 tons were produced. In the next 25 years colonial output reached 30,000 tons, an increase of 200 per cent., and outstripped the mother country. In this year of 1775, the colonies are believed to have possessed 80 blast furnaces and 175 forges. From about 1700 on, production exceeded local needs, so that iron was being exported to England at a rate of 2,000 to 3,000 tons a year.

### The Iron Act

The problem of the colonial iron industry agitated British politics for a good many years and led in 1750 to the famous Iron Act. It provided free entry of colonial pig-iron into Great Britain and of colonial bar iron into London, but it also specified that "no mill or other engine for slitting or rolling iron, or any plateing forge to work with a tild hammer, or any furnace for making steel shall be erected." Mills already in existence were allowed to remain. These restrictive measures were, however, openly fluoted. The result was that during the first five years under the Act, the average annual export of pig-iron rose from about 2,000 tons a year to 3,100 tons—and exports of bars increased from 35 tons to 200 tons. When a depression struck the colonial iron industry in the late 60s exports to England reached 4,800 tons of pig-iron and 2,000 tons of bar iron.

The existence of this iron industry was, of course, a key factor in the War of Independence. Without

it, the result might have been very different. Equally important was the fact that the majority of the owners and managers of ironworks were on the side of the colonists. Not only did they provide industrial support, but many of them engaged in political and military activity. At least five signers of the declaration of Independence were associated with the iron industry. George Washington himself was the son of a Virginia ironmaster, and many members of the industry were prominent on his staff.

During the war, the demand for iron far exceeded the supply. Production suffered for two reasons. First there was a critical shortage of skilled labour, which became so acute that ironworkers were exempted from military service. Second was the destruction of ironworks by the British—as mentioned earlier at Valley Forge. But the size of the industry and its dispersal so widely made it possible to maintain a reasonable flow of military supplies. One historic contribution was the fabrication of a massive iron chain which in 1778 was stretched across the Hudson at West Point to deny his Majesty's gunboats the use of the upper part of the river. This chain was 1,500 ft. long. Each link was 2 ft. long and weigh 100 lb. Pieces of it are preserved today at West Point.

At the close of the war, however, the iron industry suffered a decline. Not only had many ironworks been destroyed, but those that remained were largely obsolete. New facilities were needed, but there was a general post-war depression, labour and materials were scarce, and there was a lack of adequate transportation. To make matters worse, the industry in Britain was making impressive strides and iron could now be imported for less than cost of domestic production. These generally unfavourable conditions, together with the rising pressure of population along the seaboard, where most of the available farmland had been occupied, gave rise to the great westward migration beyond the Appalachian mountains.

This area of vast forests and wide plains, inhabited only by a few Indians and a handful of explorers, provided a vacuum into which new settlers from the East, and even from Europe, were naturally drawn. The magnitude of this expansion is often overlooked, yet it was closely associated with the progress of the iron industry in the United States.

Within a span of 60 years, from 1790 to 1850, the population increased from 4,000,000, almost entirely within the original 13 colonies, to 23,000,000 in some 31 States.

### Pittsburgh—"a Thriving Village"

These pioneers lived a primitive frontier life similar in many respects to that of the early colonists. Iron was scarce, especially in the remote districts. Consequently, one of the first concerns of these settlers was to establish an iron industry. In 1792, the first blast furnace was built in Pittsburgh, which was rapidly developing from a frontier fort to a thriving village. The location, of course, was ideal since two rivers meet there to form the Ohio, which flows in the direction the pioneers were moving.

Moreover, the iron industry continued, as it had from the start to produce mainly for an agricultural population. It was still based, as it would be for a long time, on the use of charcoal. But as the 19th century got under way, the beginnings of the Industrial Revolution appeared and greatly stimulated the expansion of the country as a whole and of the iron industry in particular. Innovation came with bewildering rapidity.

In 1807, Robert Fulton built a steam-powered boat and sailed it up the Hudson river from New York to Albany, thereby opening up a new era in water transportation. In 1810, Isaac Pennock installed the first American sheet-rolling mill at his Brandywine rolling mill at Coatesville, Pennsylvania. Two years later, his son-in-law, Dr. Charles Lukens, rolled boiler plates of wrought iron for the first time. The first introduction of Henry Cort's puddling furnace and grooved rolls to produce bars was at Uniontown, Pennsylvania, in 1817. Others soon appeared in Pittsburgh, where eight were built during the 1820s, most of them driven by steam power. On Christmas Day of 1830, the first scheduled passenger railway service began.

### First Use of Hot Blast

Hot blast was first used in America in 1834 at the Oxford furnace in New Jersey. The blast temperature was 250 deg. F. and it is reported that pig output was increased about 10 per cent. In America, it is interesting to note, the use of hot blast preceded the use of coke, whereas the reverse was true in England.

Although coke had at this time been in use in England for about 125 years, there was little incentive to use it in America so long as the great timber lands were still available. As these began to disappear, however, there was a rising interest in the use of coke, but the early trials met with little success. Coke was used successfully in 1835 in eastern Pennsylvania, but its use did not spread until many years later.

The next year an enterprising Lutheran clergyman turned ironmaster, Dr. Frederick W. Geissenhamer, built a furnace named Lucy near Pottsville in the coal-mining region of Pennsylvania. There, blowing his furnace with heated air, he made the first pig-iron with anthracite coal as the only fuel. By 1842, the use of anthracite coal was well established and continued for many years. About this time a flood of new devices aimed at helping the farmer appeared and provided the growing iron industry with new outlets. Among them were the introduction of the steel plough and the reaper. The homesteader on the mid-western plains found that the cast-iron plough which he had brought from the east dulled quickly in the tough prairie sod and the heavy soil would not scour off. The steel plough first developed commercially by John Deere in 1837 did the job and enabled the farmer to open up large tracts for growing grain. The invention of the reaper about the same time by Cyrus McCormick made it possible to harvest the larger crops.

Meanwhile, the growing transportation system needed bridges. The first American bridge entirely

of cast iron was built in 1840 and crossed the Erie Canal at Frankfurt, New York. Other cast-iron bridges soon followed, but as in Europe they collapsed at an alarming rate. Bridge builders then turned to wrought iron. This new look was facilitated by progress in rolling mills. The pioneer in successful development of the three-high rolling mill in this country appears to have been John Fritz, who erected a plant of this kind at the Cambria ironworks in Johnstown, Pennsylvania, in the mid 1850s to roll rails. This is the same John Fritz who was later honoured in many ways by the Iron and Steel Institute.

The first wrought-iron I beams rolled in the US were produced in a 3-high mill by Peter Cooper at the Trenton ironworks in 1854. He intended these for the Cooper Union building in New York on which work had already started, but he allowed them to be used for the rebuilding of Harper & Bros., a publishing house, which had burned the year before. The Harper building thus became the first in the US to employ wrought-iron beams in masonry walls as a lateral support. This six-storey building had, incidentally, a cast-iron front. The Cooper Union building built shortly afterward is still standing. Cooper was also honoured by the institute. The invention of an elevator safety device by Elisha Otis in the same year permitted the erection of nine and 10-storey buildings and paved the way for the skyscrapers to come.

While all this progress was being made in the production of iron, a small steel industry was struggling along. The colonists were making steel by the cementation process, but the amount produced was very small and the quality variable. In 1810 output was only 917 tons. In 1831 there were but 14 steel furnaces in the United States with an annual capacity of 1,600 tons—about equal to the amount imported. Shortly after this, in 1832, the crucible steel process was successfully established by the Garrard brothers in Cincinnati. Their firm prospered for a few years and they supplied the steel for the blades of the first McCormick reapers—at a cost of 18 to 25 cents per pound. But about this time, there was a reduction of tariffs under President Jackson, which led to a sharp increase in imports. This caused many difficulties, culminating in the panic of 1837, which ruined the Garrard brothers as well as many others. The crucible steel industry was not to revive until the Civil War period.

### Pioneer of Malleable Iron

About this time, a young Pittsburgher named William Kelly, who is said to have had a penchant for "science," was busily learning all he could about chemistry and metallurgy with the aim of entering the iron business. Eventually he and his brother John purchased an ironworks at Eddyville, Kentucky. They exhausted their own timber lands within a few years and so had to haul charcoal from a distance. Kelly naturally began to think of ways to save fuel.

There is a story, perhaps apochryphal, that one day in 1847 as he watched his refinery he noticed that molten iron under the air blast was apparently hotter than the rest. It is said that he guessed that this was due to the reaction between the oxygen in the blast and the carbon in the steel—and was led to wonder whether pig-iron could be refined to wrought iron by means of air alone. He then began to work on what he called his "pneumatic process"—and in 1851 built his first converter. He became so absorbed in these experiments that he seriously neglected his business, so seriously in fact that his creditors, including his father-in-law, told him that he must cease spending any time on what they called "that crazy Irishman's air-boiling process" or settle his debt. He could not afford to ignore this ultimatum, but it is said that he continued his trials in a secret location in the forest. He finally succeeded in producing malleable iron and sold it fairly extensively. In 1857 he transferred his operations to the Cambria Ironworks at Johnstown, Pennsylvania. This plant is now part of Bethelehem Steel Company and one of his converters stood for many years in the lobby of the plant office. It has now been moved to Bethlehem.

### Patent Granted

Kelly, like so many men of his type, was in no hurry to patent his process since he wanted to perfect it. But when he learned that Henry Bessemer had applied for an American patent in November of 1856, he put in his application at once. The matter of an interference between his application and Bessemer's patent came before the Commissioner of Patents in April, 1857—a speed which seems incredible in the light of present day Patent Office actions. On April 13, the Acting Commissioner ruled that: ". . . by the concurrent testimony of numerous witnesses Kelly made the invention and showed it by drawings and experiments as early as 1847 and this testimony appears to be reliable in every respect. . . . Priority of invention in this case is awarded to said Kelly and it is ordered that a patent be issued accordingly unless an appeal is taken within 60 days from this date." No appeal was made and Kelly was granted a patent on July 23, 1857.

Unfortunately, in this same year there occurred another panic in which he was forced into bankruptcy. When business revived in 1861 he sold his patent to two noted ironmasters—Capt. Eben B. Ward and Z. S. Durfee, who two years later joined with others to form the Kelly Pneumatic Process Company in which Kelly retained an interest. An exerimental unit was built at Wyandotte, Michigan. The Kelly Company soon decided, however, that to make steel it would need the Mushet process of adding spiegeleisen. Accordingly, it obtained American rights to that patent. As a result, the first converter steel in United States was produced in September, 1864, at the plant at Wyandotte.

But the Kelly Company found it also needed the accessory machinery invented by Bessemer. The patent for this equipment obtained in 1864 was, however, controlled by the Albany & Renssalaer Iron & Steel Company at Troy, New York, which was headed by Alexander Holley, one of the great steelmasters of the 19th century, so recognized with the award of the Bessemer Medal in 1882. The Holley group, in turn, needed rights to use

Mushet's patent. After considerable litigation the two groups consolidated to form the Pneumatic Steel Association.

There was still much to be learned about the Bessemer process and there were many false starts and failures. But Alexander Holley proved a resourceful man and, through improvements in the process and in the equipment, he, more than any other man in America, established this type of steel-making. In 1867, the year after the basic patents were consolidated, production of Bessemer steel was 3,000 tons. Thirteen years later production had reached 1,000,000 tons, surpassing that of Great Britain for the first time.

But the Bessemer process did not have the field to itself for long. In 1868, two years after the formation of the Pneumatic Steel Association, Abram S. Hewitt installed an open-hearth using the Siemens-Martin process at the New Jersey Steel & Iron Company at Trenton, though it never worked with any regularity. A small 5-ton furnace built a few years later in South Boston appears to be the first to work regularly. Nevertheless, the Bessemer process maintained its leadership during the rest of the 19th century. And beyond this, it was not until 1886, when the steel age was 20 years old, that the output of hot-rolled steel products in America exceeded that of iron.

### Andrew Carnegie Settles in Pittsburgh

About this time there appeared on the scene a gentleman by the name of Andrew Carnegie. Born in Dunfermline, Scotland, in 1835, his family came to America in his 13th year and settled in Pittsburgh. Beginning as a bobbin boy in a textile mill, young Andrew progressed through the job of telegraph messenger boy to telegraph operator for the Pennsylvania Railroad. By his 24th birthday he had become superintendent of the Pennsylvania's Western Division. In this position he was quick to see the importance of the iron and steel industry to the growth of the railroads and to that of the country as a whole. In 1865, when he was 30, he resigned from the Railroad and organized the Keystone Bridge Company. A little later, he became interested in other iron companies and in late 1870 organized Kloman, Carnegie & Company, the first company to bear his name. The new group at once started construction of the famous Lucy furnace.

At the same time, a rival group built the Isabella furnace—both going into blast in 1872. There followed a production race between these two giant furnaces of their day. On October 24, 1874, Lucy smelted more than 100 tons of iron—and ironmasters both at home and abroad went to Pittsburgh to see this marvel.

On a trip to England in 1872, Carnegie was given a demonstration of the Bessemer process by Henry himself, then serving as president of the Iron and Steel Institute, and returned resolved to get into the production of Bessemer steel rails. He therefore organized the Edgar Thomson Steel Company, named after his friend, who was president of the Pennsylvania Railroad. When the panic of 1873 hit, Carnegie bought out his partners and thus gained control of the company, which became a very successful producer of steel rails.

It is now necessary to digress a bit to pick up another important thread in the development of the steel industry—the discovery and exploitation of Lake Superior iron ores. In 1844 the Federal Government sent a group of surveyors into upper Michigan to chart the region. They noted the presence of iron ore, but did nothing beyond mentioning it. However, when a man named Philo Everett heard the rumours he went into the region with the aim of prospecting for iron ore. What he found delighted him as he quickly organized the Jackson Mining Company with title to a square mile near Negaunee. His venture was not successful, however, but in 1849 a new company called the Marquette Iron Company leased part of the property of the Jackson mine and on July 7, 1852, shipped six barrels of ore to New Castle, Pennsylvania. This is the first recorded shipment of ore down the Great Lakes. Other discoveries on the Vermilion range followed, but the real find came in 1890 when the great Mesabi range was discovered by timber cruisers in the area. It was the first discovery of soft iron ore. In 1892, some 4,000 tons of ore was shipped, but within another year this rose to 600,000 tons.

When iron ore was first mined in the Lake Superior region, it was horse-drawn to docks and loaded on to sailing ships by wheelbarrows. When the ship reached the rapids in the St. Mary's river between Lake Superior and Lake Huron it had to be unloaded and carted around the rapids to another vessel. As the trade grew, the first Sault Ste. Marie lock was built and opened in 1855.

Meanwhile, great changes were taking place in steel technology and the easy availability of the good Lake Superior ores was to accelerate them. The Bessemer process, having a head start on the open hearth, maintained its lead during the 19th century, though the challenge from the open hearth was growing. Thus, between 1890 and 1900, the production of Bessemer steel increased less than twofold, while that of the open hearth increased some six and a half times.

It has been noted earlier that by 1880 there were a number of open-hearth furnaces in operation in the United States. These were, of course, used on acid lining of sandstone or other form of silica. This required ores relatively low in phosphorus which were not abundant. The answer, so far as the Bessemer process was concerned, was found by Sidney Thomas and P. C. Gilchrist in England in the use of a basic lining. Their process was patented in the United States in 1877, but was never widely adopted.

### Use of Basic Open-hearth Furnace

The use of a basic open-hearth furnace in 1885, which was well suited for the Lake Superior ores, then becoming available, revolutionized steel technology in America. And other technological advances were coming rapidly.

By this time, two other products of the industry had become important. The first, which owed

its growth to the opening of the western prairies, was barbed wire for fencing. The homesteaders had a vexing problem in the protection of their cultivated fields from animals. Fences were needed, but the prairie provided neither stone nor timber. Sod fences and thorny hedges were tried, but were unsatisfactory. Many were thinking about a solution, but the practical answer, barbed wire, came almost simultaneously from two men, both residents of DeKalb, Illinois. They were Joseph Glidden, a farmer, and Jacob Haish, a carpenter. Their patent applications were filed a little over a month apart late in 1873, which led to 20 years of litigation from which Glidden emerged the winner.

At first, there was some opposition to the use of barbed wire from farmers, who feared the barbs would injure their animals. But once introduced the product caught on, particularly when steel wire became available. Production rose from 10,000 lb. in 1874 to 80,500,000 lb. in 1880. The man who broke the initial opposition of cattlemen to barbed wire was John W. Gates, who was a salesman for his uncle, who, in turn, owned a half interest in Glidden's patent. Gates' flamboyant methods enabled him to become a dominant figure in the wire industry and the principal founder of the American Steel & Wire Company.

The other product was tinplate. Although an attempt was made to produce this material for cans in Pittsburgh in 1858, it failed, as did others, because no domestic producer could compete either in quality or in price, with tinplate from Wales. Finally, in 1890, William McKinley, then a Congressman from Ohio, later President, pressed the passage of a Tariff Act, which substantially raised the duty on imported tinplate. Immediately, there was activity among American steelmakers. One of the first fully equipped tin mills in America was built in 1891 and 1892 at Elwood, Indiana, by the American Tin Plate Company. In the next 15 years the growth of the industry was spectacular. The tariff remained a matter of political agitation for many years, but in spite of various changes production increased until it reached the million-ton level in 1911 and the next year surpassed that of Great Britain.

### Activity in the South

Although most of the development of the steel industry was occurring around the Pittsburgh and Chicago districts, some activity was also under way in the south (TCI). At the beginning of the 20th century the steel industry had grown in size and in diversity. It was producing more than 15,000,000 tons of iron and some 11,400,000 tons of steel, of which 7,500,000 was still Bessemer product. About one third of the Bessemer tonnage went into rails. Also well over 300,000 tons of tinplate. Ore was in plentiful supply, largely from the Lake Superior region, coal plentiful, and beehive coke easy to obtain. Curiously enough, some 500,000 tons of charcoal pig-iron were still being produced, mainly in Michigan.

At this time the industry was largely dominated by Andrew Carnegie with his Carnegie Steel Company, of which Charles M. Schwab was president, but he was threatened by the Federal Steel Company, backed by J. P. Morgan and having Judge Elbert H. Gary as its president. The only other major steel producer was the National Steel Company, controlled by the Moore brothers, who had established the Diamond Match Company and the National Biscuit Company.

### Finished Steel Products

The leading companies for making finished steel products and for fabrication were the National Tube Company, and the American Bridge Company, controlled by Morgan; the American Steel & Wire Company, controlled by John W. Gates; and the American Tin Plate Company, American Sheet Steel Company, and the American Steel Hoop Company, all controlled by the Moore brothers. Since the advantages of integrated operation had by this time become apparent, a number of complicated dealings got under way. Their ramifications are a story in themselves. It is sufficient to record here that in the end all of these companies, except American Bridge, became incorporated in February, 1901, as the United States Steel Corporation. Shortly afterward American Bridge was added, as well as some iron-mining holdings, such as Lake Superior Consolidated Iron Mines and the outstanding interest of the Oliver Iron Mining Company. The president was Charles M. Schwab, with Gary as chairman.

Carnegie at this point turned his still tremendous energy to philanthropic pursuits, but he did not sever his ties with the steel industry, since he served as president of the Iron and Steel Institute from 1903 to 1905.

In 1903, Schwab resigned as president of United States Steel and in 1904 was instrumental in the organization of another large integrated steel firm—Bethlehem Steel Corporation. The nucleus was the Bethlehem Steel Company, but the new company also included, either at the start or shortly thereafter, the Pennsylvania Steel Company, the Maryland Steel Company with its plant at Sparrows Point, the Lackawanna Steel Company with a plant at Buffalo, New York, the Cambria Steel Company of Johnstown, Pennsylvania, and the Pacific Steel Company.

The development of the industry from the first world war on is too well known to require much comment, but I should like to point out that during the last war, a large steel mill was built at Geneva, near Salt Lake City, Utah, and another at Fontana, near Los Angeles. The former later became part of United States Steel Corporation and the latter belongs to Kaiser Steel.

The most notable development since the end of the war has probably been the change in the ore supply. For almost 50 years the main source of iron had been the direct shipping ores of the Lake Superior region and during this period some 2,500,000,000 gross tons of ore had been shipped. Although this supply was by no means exhausted, it became evident that with continued growth of the country other sources must be found. The search

took two forms. One was exploration for foreign sources of high-grade ore. This was successful notably in Venezuela and in the great Ungava trough of Labrador and Quebec. Both of these areas have now been developed and are contributing to the nourishment of the American industry. In addition, ore is being imported from Chile, Peru, Brazil, Liberia, Mexico, Sweden, and elsewhere.

The second search was for an economical means of upgrading the large resources of low-grade ores remaining in the Lake Superior region. This has led to the successful development of two large taconite concentrating plants. Although these are important, the trend toward imports continues and has increased over the last 10 years.

The year 1960 was one in which ingot production was very close to 100,000,000 tons, which represented about 1,100 lb. *per capita*. This was considerably below the record production of 117,000,000 tons in 1955, but well above the maximum provided during the last war. Of this tonnage, 87 per cent. was made in basic open-hearth furnaces, 8.4 per cent. in electric furnaces, 3.4 per cent. by the basic oxygen process, and 1.2 per cent. was produced by other methods. As to types, 91.5 per cent. was in the carbon steel grades, 7.5 per cent. in alloy steels, and 1.0 per cent. in stainless alloys.

Shipments of steel in the domestic market were 21.3 per cent. to automotive industries, 16.5 per cent. to warehouses and distributors, 16.3 per cent. to construction and contractors' products, 10.3 per cent. to machinery (including electrical and farm equipment), 9.4 per cent. went to containers (chiefly to cans and closures), 7.1 per cent. was used for converting and processing (including forgings, nuts, bolts, rivets, and screws), and 5.5 per cent. to the appliance and commercial furniture; 5.4 per cent. went to the oil and gas industry, 3.6 per cent. to rail transportation, 1.3 per cent. to shipbuilding, and 3.3 per cent. to other miscellaneous uses.

## International Ore Preparation Congress

SIXTH international ore preparation congress, organized by the ore preparation department of the Société de l'Industrie Minerale, will meet at Cannes (Alpes-Maritimes), France, from May 26 to June 2, 1963. It will be followed by technical visits in France and various Mediterranean countries.

Scientists and engineers wishing to submit papers to the congress should write to the general secretary of the congress at 28, rue Athur-Rozier, Paris 19, as soon as possible.

### Coke Oven Managers' Year Book

The 1961 edition of the "Year-book of the Coke Oven Managers' Association" includes the annual meeting, presidential address, and report of the annual dinner. A list of members is followed by particulars of coke-oven plants in Great Britain and abroad and also a report of transactions for the year 1960-61. Dr. R. A. Mott is president of the association.

## Oil Increases Blast-Furnace Efficiency

BLAST-FURNACE performance can be improved by the injection of oil. This has been proved at the Ebbw Vale Works of Richard Thomas & Baldwins, Limited, where the first full-scale experiments carried out in Great Britain on this technique started early this year. During a six-month trial period about 50 tons of oil per day were used and analysis of the results obtained showed advances in outputs, quality, and general furnace performance which justify retention of the system.

Two methods of injection have been tried—through stainless-steel lances and also specially designed tuyeres. Experiments are continuing to decide the most effective techniques.

Briefly, the installation consists of small-bore feed pipes to each tuyere or lance, pumps to maintain the oil pressure, and a bulk-storage heating and circulating system. The injection of oil in this lower zone of the furnace provides a very efficient method of reducing the iron oxides of the ores to the metallic state and diminishes the quantity of prime metallurgical coke charged to the furnace.

A success story also comes from the neighbouring "B" blast furnace at Ebbw Vale. In May of this year a stack scaffold in this 18-ft. hearth furnace was removed by explosives, using a technique new to Great Britain. In the week ended September 30 "B" furnace achieved its best output, the total produced being 88 tons more than the previous best set up in June, 1957. This record was on a furnace which had been in commission more than six years, had produced more than 1,000,000 tons of iron from unprepared burden, and was originally scheduled for relining this year.

Flue dust losses for the record week were only 80 lb./ton of hot metal, compared with 350 to 400 lb./ton on lower outputs before the scaffold removal.

## *Blast-furnace Automatic Taphole Drills*

IMPORTANT step towards increased pig-iron production, coupled with greater safety for blast-furnace operatives, is expected as a result of installing a pair of automatically controlled pneumatic drills for opening the tapholes of Nos. 4 and 5 furnaces of the Steel Company of Wales, Limited.

Being remotely controlled by the operator, who is stationed at a safe distance, these drills can bore right through the plug to the liquid iron thus obviating oxygen lancing. They also permit the use of taphole clay of stronger and harder composition than hitherto, and should, therefore, minimize delays in cast-house preparation for castings by ensuring that the iron leaves the furnace under better control and is subsequently easier to handle to the ladles.

# STEEL INDUSTRY'S PROSPECTS

## Board Chairman Talks of the Recession

CHIEF guest at the annual dinner of the Newport and District Metallurgical Society on October 20 was Sir Cyril Musgrave, chairman of the Iron and Steel Board, who declined to forecast how long it would be before the present recession lifted. The Iron and Steel Board, he said, had a duty to promote the efficient, economic, and adequate supply of iron and steel products. Supplies were now adequate and the board was turning more and more to the other charges laid upon it—efficiency and economy.

Speaking of the economic situation generally he said: "For most of the time it has been fairly easy to sell most of the things we produce. This is no longer so, and if Great Britain is to recover its full economic strength and vigour it must seek more and more to meet increased costs through increased efficiency. This will become even truer if we enter the Common Market."

SIR CYRIL MUSGRAVE

This increased efficiency would come through the efforts of managers, technicians, and engineers, and also through new plants and machinery. "The new strip mill at Newport—the Spencer Works—which will embody the most advanced automation ever employed in such a plant is an example," he said. Increased efficiency would also come through the scrapping of obsolete ideas by both management and men.

### "Anomalies of Our Age"

Referring to what he described as "one of the great anomalies of our age," Sir Cyril said: "We advance our mastery over the material things almost daily. There seems no limit to what man can do. He can split the atom, devise new materials, and travel into space. But he cannot manage the most simple relationships with his fellow man, either internationally, with his fellow countryman or with those whose interests, if he could only see it, are identical to his own."

The British iron and steel industry had not supported the Government's decision to seek entry into the Common Market, said Mr. G. H. Latham, chairman and managing director of the Whitehead Iron & Steel Company, Limited, who is the president of the society. He said the decision to negotiate for membership was a Governmental decision, not a decision of the iron and steel industry. The industry had been consulted some time ago.

"We were asked for our opinion by the Government as to the prospects and effects on the steel industry," he said. "We were very doubtful and gave the Government very little encouragement." Now they had to accept the political decision which had been taken and work to make it a success. But a period of transition was essential. The steel industry has made it clear that a period of transition would be very necessary because the whole system of pricing under the Common Market is completely different from that now employed by our industry," he said.

Referring to the present recession, Mr. Latham was optimistic for the future. "I have abundant faith that some time sooner or later all the new capacity we are bringing into operation will be needed," he said. Earlier, however, he had repeated the recent warning from the Duke of Edinburgh for employers and employees alike to "get their finger out."

The steel industry was in no way responsible for the present recession. A contributory factor was that the Chancellor of the Exchequer had found it necessary after making his orthodox Budget, to introduce his "little Budget." This, said Mr. Latham, had upset all their plans to bring the industry back on its feet this autumn.

Referring to some of the difficulties facing the industry, he said: "After the war they (politicians) said that in no circumstances would Germany be allowed to produce more than 9,400,000 tons of steel a year. West Germany alone last year produced 28,000,000 tons against our 22,000,000 tons."

All over the world nations are laying down their own steel plants and becoming self-sufficient. "We have seen our markets disappear one by one," Mr. Latham said.

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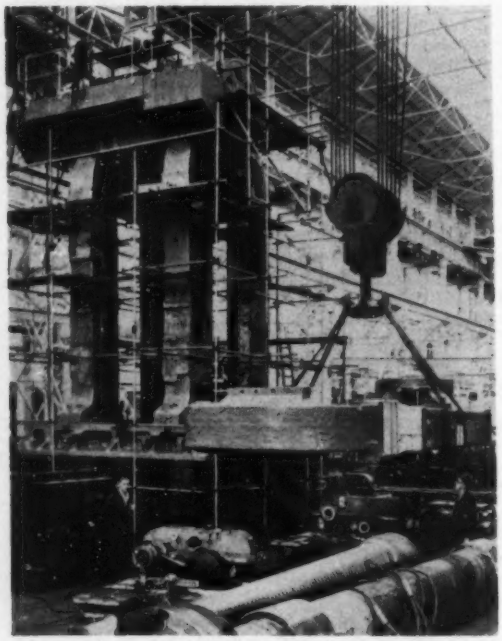
HOESCH AG, has brought into operation a new five-stand cold-reduction mill at Westfalenhütte, Dortmund, Handelsblatt reports. The mill will have an initial output of 30,000 ton/month, rising eventually to 40,000 ton/month. It replaces an old mill with a capacity of 18,000 ton/month. The company has also completed a new sinter plant with a monthly output of 120,000 tons, a quarter of which will be supplied to Dortmund-Hörde Hüttenunion.

# DARNALL WORKS HAS BIG ORDER-BOOK

BIG contracts for customers at home and abroad are currently in progress at the Darnall Works in Sheffield of Davy & United Engineering Company, Limited, and Davy & United Instruments, Limited (both wholly owned subsidiaries of Davy-Ashmore, Limited). The current order-book for the group (which also includes Davy & United Roll Foundry, Limited, Ashmore, Benson, Pease & Company, Limited, the Power-Gas Corporation, Limited, and Rose, Downs & Thompson, Limited) is:—Home, £46,000,000; export, £15,000,000, making a total of £61,000,000. Total for Davy & United Engineering is £29,000,000 (home, £24,000,000; export, £5,000,000).

In the year ended March 31 last, the group exported to no fewer than 69 countries. The number of employees in the group now totals 8,805 (8,116 at home and 689 oversea).

A representative of IRON AND COAL recently visited the Darnall Works, the headquarters of Davy & United Engineering and Davy & United Instruments. In the patternshop he saw a variety of patterns to different designs, reflecting the individuality of steelworks plant engineering. Steel fabrications up to 60 tons in individual weight, including work for hot- and cold-strip mills, for Richard Thomas & Baldwins, Limited, Colvilles, Limited, and the Steel Company of Wales, Limited, were seen in the fabricating department. There were also fabricated units for furnace equipment; table frames for rolling-mill main tables, and a number of fabrications produced for general engineering applications, such as rock-crushing machines, diesel-electric locomotives, end frames, and stator shells.



THIS PHOTOGRAPH SHOWS ONE OF THE FINISHING STANDS OF THE HOT-STRIP MILL FOR THE SPENCER WORKS OF RICHARD THOMAS & BALDWINS, LIMITED, UNDER CONTRUCTION IN THE HEAVY ERECTING SHOP OF THE DARNALL WORKS. THE MILL HOUSINGS SHOWN WEIGH 125 TONS EACH.

### Plant for Spencer Works

A wide variety of work, including the machining of plate-mill housings up to 154 tons and hot-strip mill housings up to 144 tons in weight, strip-mill chocks, tension reel components for cold-strip mills, and other similar items is in progress in the machine shops. In the erecting shops one of the finishing stands (F.5) for the new hot-strip mill for the Spencer Works of Richard Thomas & Baldwins was seen completely erected, while another finishing mill stand for the same installation (F.6) was in process of preparation for erection. Erection work was proceeding on two 24-in. edging mills for the RTB Spencer Works' contract, while work was also in progress on pinion housings for three of the finishing stands for the Spencer Works hot-strip mills, Nos. F.4, F.5, and F.6. A large scalebreaker gearbox for the new hot-strip mill now being built for the Ravenscraig Works of Colvilles, Limited, was also on view.

In the workshops of Davy & United Instruments electronic weighing equipment, automatic gauge control equipment, and gamma-ray thickness gauges for rolling-mill application were all seen in course of production.

Models of rolling mill and forging press installations were set out for inspection in the reception hall of the main offices, while there was also a photographic display illustrating the activities and potential of the Davy-Ashmore group.

Oversea orders currently being carried out by Davy & United Engineering include a 25-stand continuous wire-rod mill capable of rolling various sizes of coiled wire rod, four strands simultaneously, at finishing speeds of up to 7,000 ft./min. Value of this order, for the Broken Hill Proprietary Company, Limited, Australia, is just under £1,000,000. Foreign business includes orders for Switzerland, Holland, and Czechoslovakia. Eight gamma-ray thickness gauges for installation in plate and strip mills in the Soviet Union are among the oversea orders now on the books of Davy & United Instruments, the value of that particular contract being about £90,000.

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THE BRITISH BATH COMPANY, LIMITED, a subsidiary of Allied Ironfounders, Limited, has recently completed at Greenford (Middx), a new amenities building for its 500 employees. The company operates at Greenford the largest bath factory in the United Kingdom, producing bath castings at the rate of more than two a minute.

# NEW LITERATURE

REFERENCE is made below to some of the house magazines, catalogues, brochures, and other publications received. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

FEEDWATER SPECIALISTS COMPANY, St. Paul's Square, Liverpool 3—Two technical publications (Nos. 234 and 235) have been issued on "Boiler Blowdown."

MATBRO, LIMITED, Horley (Surrey)—The Matbro "40" forklift, designed with the operations and situations peculiar to the brick industry in mind, is the subject of a leaflet. This machine, with the rest of the Matbro 1961 range of fork trucks, can be seen at the Factory Equipment Exhibition, which opens at Earls Court, London, on November 13.

STEWARTS AND LLOYDS, LIMITED, Brook House, Upper Brook Street, London, W.1—The Review News (1d.), a newspaper for the company's employees, is always filled with interesting material, and the October issue is no exception. Included is an account of the opening of the new residential hall at Corby, primarily intended for students employed by the company.

INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Thames House, Millbank, London, S.W.1—More than 100 abstracts of recent technical and patent literature are contained in the July/August issue of the Nickel Bulletin, which has recently been published. The section concerned with nickel-containing heat- and corrosion-resisting materials is, as usual, the most extensive of the issue.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LIMITED, Parnell House, Wilton Road, London, S.W.1—A handsome publication on Wellman steelworks, plants and equipment has been issued. It gives full details of the plant manufactured by the company and outlines many of the installations made in this country and in other parts of the world. Many excellent photographs in full colour are included.

BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION, Cleeve Road, Leatherhead (Surrey)—J. C. Needham writes on "Control of Transfer in Consumable Electrode Welding" in the October number of Co-operative Electrical Research (2s. 6d.). Author of "Contact Wear in Light-duty Electromechanical Relays" is W. Nethercot, while other features include an article by C. E. R. Bruce on "Radio Galaxies, Galactic Evolution, and the Great Cosmological Controversy."

ALCAN INDUSTRIES, LIMITED, Bush House, Aldwych, London, W.C.2—In the October issue of Aluminium News, the editor writes: "A well-known expression is that aluminium is used for everything from A to Z. For amusement, one of our writers made up a 'starter' list of some of the A to Z uses." In case you are already wondering what entry was made for Z—we thought hard and then didn't get it!—we will put your mind at rest—zipper wire. What about X? But that's too easy, so not even a clue!

TIN RESEARCH INSTITUTE, Fraser Road, Perivale, Greenford (Middx)—Anti-friction linings of turbines must be securely bonded to their iron supporting shells. An article in Tin and Its Uses (1961, No. 53) describes in detail the techniques of tinning the shells and casting the tin-base anti-friction linings into them. The improved quality of bronze rods and tubes made by the continuous casting method developed at the Tin Research Institute has led to the adoption of this method by bronze founders in many countries.

BRITISH OXYGEN COMPANY, LIMITED, Bridgewater House, Cleveland Row, St. James's, London, S.W.1—The October issue of Pennant, the company's monthly newspaper, contains a four-page supplement on the BOC 1961 oversea conference. Chairmen and managing directors from 14 associated companies oversea came to London for discussions with the parent company's executives. Latest technical developments, marketing trends in an increasingly competitive world, and the establishment of closer links within the group were some of the topics discussed.

CONCRETE, LIMITED, 16, Northumberland Avenue, London, W.C.2—The outstanding advantages of standardization in manufacturing are well established and understood. The disadvantages of standardization in architecture are equally well known. Preferred dimension frame construction is a precast concrete technique designed to secure the advantages of standardization in manufacture, without the imposition of standardization on structures. The structural and economic advantages achieved well reward the submission to the modest degree of architectural discipline involved. The salient points of the Bison preferred dimension frame are described in a 34-page booklet.

RICHARD THOMAS & BALDWINS, LIMITED, 82, Brook Street, London, W.1—Up to a few years ago, the Sahara Desert was merely known as a place of desolation and a source of adventure stories. But the Sahara is changing. Oil is already being produced in quantity from the previous barren sands and by the middle of 1963 it is expected that iron ore from the western edge of the desert will come onto the markets of the world. The ore will be mined from the grey hills of Mauritania, in north-west Africa, which are known as the Khedia d'Idjil. RTB is one of nine leading UK steel companies, which, combined with the British Steel Corporation, have a stake in this, and other oversea ore projects, through the recently formed British Ore Investments Corporation. The story is told in the October issue of Ingot News (1d.).

MONSANTO CHEMICALS, LIMITED, Monsanto House, 10-18, Victoria Street, London, S.W.1—Monsanto Mail (No. 8 has just been published) is one of those magazines which demands attention. Its cover (the design changes from issue to issue) does more than catch the eye; it invites one to study it. The articles cover a variety of subjects and the accompanying illustrations are of a high standard. Included in the latest number are "Make the Most of that Chink" (Frank Hennig says that the day of the milkman may soon be done), "A Woman's Work" (Dilys Rowe says that it is never done without the help of industry), "Bringing them Down in One Piece" (in which James Hay Stevens writes about greater safety in landing for the giant jet airliners and their passengers), and several other interesting features.

STEEL, PEECH & TOZER (branch of the United Steel Companies, Limited), The Ickles, Rotherham—Next February, the Phoenix Gazette (2d.) is due to celebrate

its 30th year of publication, but it may well be that this excellent house magazine will not live to celebrate a further anniversary. Investigations are at present being made into the possibilities of publishing a weekly newspaper, in tabloid form. This would supersede the Gazette, the October issue of which points out, quite rightly, that a weekly could provide a medium for the quicker dissemination of news. In the meantime, we have enjoyed the article on "Western Europe and US: The Challenge of the Common Market," by W. Hawkes, commercial research manager of United Steel, and the other features of the latest issue of the Gazette.

ARMSTRONG WHITWORTH (METAL INDUSTRIES), LIMITED, Close Works, Gateshead-on-Tyne—Close-up, a quarterly, is one of those house magazines that manages to combine happily short technical articles with travel and other general features. The editor, M. L. Wilson, also finds space for a page or two of news of employees. The September number, just published, contains the first part of an article on "Modern Methods of Earth Compaction," the author being G. W. C. Garrould, technical adviser to the board of Barry & Company, Limited. There is also the final article in T. F. Swallow's series on "Production and Management Control," "Jigs, Tools, and Gauges," by Alan Jackson, among other more serious contributions. On the lighter side, we found "Peace," in which Percy Beall writes about inland waterways, very enjoyable; we share his enthusiasm for a holiday such as he describes. E. B. Ellis tells readers about his second visit to Salonika.

INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Thames House, Millbank, London, S.W.1—A French motor-car dealer, interviewed in the "Panorama" programme (BBC-TV) on October 16, said that the performance of British cars was competitive and that the finish of British cars had always had a very good reputation in France. He enlarged on this point by saying that his customers were specially impressed by "British chrome." The Mond labelling scheme for quality plate is devised to promote such confidence in plating. The scheme, which started in 1959, is to label plated goods which conform to BSS 1224:1959. This guarantees to the customer that the article he buys has been plated with an adequate layer of nickel under the chrome and it is that nickel layer which provides the protection from the corrosive conditions under which it is designed to be used. "Confidence in Plating," a booklet published by the company, explains the scheme in detail.

KOREAN TRADERS' ASSOCIATION, Seoul, Korea—The Korean Trade Directory is published annually "in the hope that it will be of practical use in developing trade with Korea." Copies of the 1961 edition are available without charge on application to the association. The directory contains 842 pages filled with information designed to be an oversea businessmen's guide to the foreign trade of Korea. The 1961 edition includes a Korean trade section providing general information on the country, international commerce, industry, finance, and trading practices. The contents of this portion will give an idea of trade and economic affairs in general and provide an opportunity for oversea firms to familiarize themselves with Korean business methods. Also included is a complete alphabetical list of goods exported and imported by Korean traders, together with the names of the firms handling them. This classified list will enable prospective buyers and sellers to get in touch at once with appropriate Korean trading houses.

# *Growth of Chile's Iron-ore Industry*

REFERENCE to the considerable growth in the iron-ore mining industry in Chile in recent years was made by the Minister of Mines when he addressed the mining committee of the Chamber of Deputies. The improvement in US prices in 1953 had, he said, encouraged the development of many smaller mines, resulting in a notable increase of exports of the small and medium mines from 273,000 tons (US $1,300,000) in 1954 to nearly 4,500,000 tons (US $30,100,000) in 1960. The largest of the producers was the Bethlehem Chile Iron Mines Company, with an annual output of some 1,500,000 tons, of which 600,000 tons was used by the Huachipato steel mill. Next in importance was the Compañía Minera Santa Fe, which in 1960 produced about 1,100,000 tons and exported 2,400,000 tons.

Chile's most important customer for iron ore in 1960 was the United States, taking 78.4 per cent. of the total, followed by western Germany (11.6 per cent.) and Japan (4.5 per cent.). It is expected, however, that with the development by the Japanese of the iron-ore mine at Las Adrianitas and the fulfilment of contracts signed with the Compañía de Acero del Pacífico and the Compañía Minera Santa Fe, future exports to Japan will expand considerably.

The Minister criticized the present system of taxation and its effect on the mining companies, and recommended that these companies should receive tax privileges to encourage their development.

## CONTINUOUS PATENTING FURNACE AT DONCASTER WORKS

LATEST wire patenting installation at the Doncaster works of British Ropes, Limited, is a 700-kW. furnace designed by Efco Furnaces, Limited, in conjunction with British Ropes' engineering staff. It is used for heating rod prior to quenching in a lead bath, and has an open-type chamber accommodating 32 rods which are positioned by guide blocks at both ends.

Special precautions have been taken to avoid damage to elements and furnace brickwork when hooked joints in the rods pass through the chamber. The hearth and walls of the furnace are made of a hard firebrick which will not score, while in the loading section of the furnace where the rods may not lay flat, the elements are protected by heavy guards suitably shaped to prevent the hooked ends catching on them.

The furnace chamber, which is 6 ft. 6 in. wide, has a heated length of 90 ft. The heating elements are of nickel-chromium strip, formed into hairpin shape and mounted in the roof.

### New Training facilities at Firth Brown

A new apprentice training school opened by Thos. Firth & John Brown, Limited, Sheffield, contains a large workshop with facilities for training apprentice fitters and electricians in the basic skills of their trade, together with a comprehensive range of modern machine tools for the training of apprentice turners. A lecture theatre equipped with visual aid equipment is provided for talks by the instructors and by invited speakers on specialized subjects. A feature of the school is the provision made for private study.

# NEW RESEARCH CENTRE FOR BRITISH ROPES

BUILT and equipped in three years at a cost of nearly £200,000, the central research department of British Ropes, Limited, Doncaster, was opened last Friday by Mr. Niall Macpherson, MP, Parliamentary Secretary to the Board of Trade. This research unit comprises wire and rope research departments and a marine testing station off the Norfolk coast.

In the wire department investigations range from raw material through heat treatment and wire drawing to the final product. The quality of hard-drawn wire is governed to some extent by the quality of the raw material—wire rods. The department is making an extensive study of the characteristics of the regular supplies of rods, particular attention being devoted to the number and type of surface defects. This is long-term work, but work which, it is hoped, will result in an improvement of raw material quality.

Good heat treatment is a prerequisite of successful wire production. While the metallurgy of plain carbon steels is fairly simple, the continuous nature of the heat-treatment process used in wire production is considerably more complex than the heat treatment of individual components. Therefore, a special recording pyrometer has been developed to reveal temperature changes in material as it proceeds through the plant. With this and supplementary work in the laboratory evidence has been produced which has enabled considerable improvements to be made.

### Physical Characteristics

Apart from finished wire quality, the precise physical characteristics of various types of wire are of great importance and much of the department's time is spent on the determination of, for example, fatigue strength, stress relaxation, and stress/strain factors. Haigh-Robertson rotating bending machines and an Amsler Vibrophore push-pull machine are in constant use for fatigue testing. An air-conditioned room houses the equipment used for determining the stress relaxation properties of prestressed concrete wire; apparatus is available for the testing of both individual wires and strand.

Efforts are always being made to improve finished wire quality, and complete metallurgical examinations of wire, both before and after service, are made from time to time. For example, it is not uncommon for each wire taken from a length of a multi-strand rope to be examined for physical properties, metallographic structure, and chemical analysis.

The department is well equipped. In addition to the apparatus already mentioned it has a range of physical testing equipment, including bend test and torsion test machines and numerous tensile testing machines. Among the latter is an Instron machine which is based on the new strain gauge cell weighing system; this enables the stress/strain properties of wire to be determined with great speed and accuracy.

As the production of high-tensile steel wire becomes more developed, the internal microstructure of the metal increases in importance. The limits of discernment of the light microscope have been reached and it is considered that only by the use of the electron microscope can further advances in the technology of wire production be made. Accordingly, British Ropes has installed in its new wire research department an Elmiskop II electron microscope manufactured by Siemens & Halske, of Karlsruhe, Germany. The Elmiskop II can resolve details only one tenth of a millionth of one inch apart, and the maximum useful magnification is about 50,000 ×.

The other half of the central research department (the rope department) is divided into six sections, devoted to chemical analysis, metallurgical examination, physical testing, fibre and synthetics' evaluation, photographic documentation, and development.

Equipment of the rope research department is extensive and varied, and includes a Zeiss photomicrographic unit, capable of examining specimens by transmitted or reflected light at magnifications up to 4,400×; a 100-ton capacity Amsler Universal pulsatory fatigue testing machine, capable of applying static and dynamic loads to ropes of up to 2½ in. dia.; a Watson stereoscope microscope with camera attachments, and a Denison 15-ton capacity hydraulically operated tensile machine.

Opening the centre, Mr. Macpherson remarked that it was sometimes suggested that British industry did not do as much research for itself as it should. That reproach, he said, could certainly not be levelled against British Ropes. Research was important to enable industries to keep up with modern trends and with the rapidly developing needs of our times. It was no less necessary to enable British industry to remain competitive and to hold its own in world markets.

In that British Ropes had been remarkably successful. In each of the past two years the group had exported some £5,000,000 worth of goods from its factories in the United Kingdom. Its achievement was due in no small measure to its success in reducing costs of production through increased efficiency.

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## Servicing Electric Motors

REALIZING that a breakdown can be a severe setback to production, Arco Rewinds, Limited, whose main service depot is at Sheldon, Birmingham, has instituted a speedy maintenance service for electric motors and associated equipment. Motors up to 20 h.p., within a 30-mile radius of the Birmingham headquarters, and at branches in London and Nottingham, are being completely stripped and rebuilt in 12 hr. A shift system enables men to be sent to deal with faults at any time of the day or night.

Motors used in the iron-ore mining industry for separators, vibrators, and pumps are common types of equipment that are being serviced. Conveyor motors are repaired for the National Coal Board, and a service is also offered for open-cast mining draglines.

# NACM President Backs Large-Coal Drive

SUPPORT of the National Association of Colliery Managers in the NCB's drive to expand the production of large coal was pledged by the president, Mr. A. E. Hiscox, at Newcastle-upon-Tyne last Friday.

Mr. Hiscox was speaking at the annual dinner of the North of England Branch of the NACM, over which Mr. J. T. Robson presided.

He recalled that at the national conference at Whitley Bay in 1958, when Mr. Robert Williams was president, the theme of the discussions was large coal, and some excellent papers were presented on techniques which could be employed to produce more coal over 2 in. in size. Despite all the efforts that had been made over the past three years, there was a possibility if the winter was a severe one that the industry would not meet the demand for domestic grades. The NCB had asked for working at selective pits throughout the country on a Saturday shift basis, and he felt that as an association they should use all the means possible in an endeavour to produce the maximum tonnage of large coal.

**Confidence of the Public**

It was essential for the future wellbeing of the industry to maintain the confidence of the public and to ensure that the coal the people required was available, not only in quantity, but also in the right quality. Mr. Hiscox thought that the prospects of coal were good and that the colliery manager was going to play a very important part in the future in providing the product the consumers required at a uniform and standard quality, and, above all, at a price which enabled the industry to maintain its favourable position with other forms of energy in the competitive field.

"If the coal required to meet the demand this winter is not forthcoming the Minister of Power, who has a responsibility to the public as a whole, must allow the importation of certain grades of domestic fuel," Mr. Hiscox said. Managers had a big part to play. Efficiency must be their keynote. Lord Robens had written that "management is leadership." The term "boss" for a manager of a pit was out of date—he was a leader, and the test of effective leadership was not how good a man was at "bossing," but how little bossing he had to do. The aim of the modern manager was to weld his men and his officials into a team.

Mr. Hiscox was replying to the toast to the guests, proposed by Mr. J. T. Robson, president of the North of England Branch. On beha'f of the branch, Mr. Robson extended to Mr. Hiscox best wishes for a happy and successful year of office as national president. He also welcomed the presence of Dr. W. Reid, chairman of the Durham Division, and Mr. Leslie Graham, chairman of the Northern (N&C) Division of the NCB. The two chairmen gave unqualified support to the association and encouraged it in every way. Their help was friendly and practical, and he assured them of the full support of the North of England Branch of the NACM in achieving the high standards of efficiency, safety, and mechanization and marketing arrangements which were their aims.

Welcoming representatives of kindred associations, Mr. Robson said that among them was Mr. James Carson, president of the North of Eng'and Institute of Mining and Mechanical Engineers, who was also a past president of the NACM and of the North of England Branch.

# CENTO Coal Symposium in Turkey

DELEGATES from Turkey, Iran, Pakistan, the United Kingdom, and the United States will present papers covering the economics of coal production, mining problems, and the geology of coal mining at a CENTO (Central Treaty Organization) Coal Symposium to be held at Zonguldak (Turkey) and other mining centres between November 30 and December 14.

Participation by CENTO country delegates is being financed by the United States through the office of the US Economic Co-ordinator for CENTO Affairs. A number of commercial firms are also expected to send observers to the symposium. Papers are invited from observers as well as delegates.

In addition to the technical papers to be offered at the formal sessions at Zonguldak, the experts will inspect surface and underground mines, coal washeries, power plants, and harbour facilities at that centre. During the following week the group will inspect mines in the vicinity of Eskisehir, including the Seyit Omer lignite strip mine and the Tuncbilek open pit and underground mines. At Soma, near Izmir, the visitors will inspect the Camlica mine and see the famous ruins at Bergama.

Copies of the full report of the symposium will be available from the CENTO Secretariat, Old Grand National Assembly Building, Ankara, Turkey, on January 1.

# *New NCB Code for Underground Manriding*

SUPERSEDING the first edition published in 1954, a revised edition of the code for manriding underground by rope and locomotive haulage has been published by the production department of the National Coal Board. The new edition takes into account recent legislation and experience on the subject gained since the issue of the first edition.

Copies are available on application to the Purchasing and Stores Department, National Coal Board, Hobart House, Grosvenor Place, London, S.W.1.

A NON-METALLIC shotblast abrasive, "No-Met," is announced by Bradley's (Darlaston), Limited, a member of the Staveley group of companies. The new product is less than one fifth of the price of the conventional metallic abrasive, it is stated.

# IRON AND STEEL TRADE

RESULTS of the Motor Show give a more promising outlook, particularly for the sheet trade and the re-rollers of light steel products and components. There are, however, still no signs that production of pig-iron and crude steel is likely to be stepped up. On the heavy side of the industry, orders for sections and joists have improved slightly but business for plate is in the doldrums and shipbuilding steel is only receiving moderate attention. Structural engineers have been rather more generous in their orders for materials.

### Pig-iron

Considerably increased business could still be met with ease by the ironfoundries and all grades of pig-iron are plentiful. The call for low phosphorus iron by the engineering and speciality foundries is still at fairly good levels, though curtailment of deliveries from foundries connected with the motor industry is still reported.

Whatever is required in the way of high phosphorus irons or the hematite and refined irons can be supplied without delay.

### Ferro-alloys

There is little change in the demand for ferro-tungsten but ferro-molybdenum and ferro-vanadium are in steady request. The 75 per cent. Si and 45 per cent. Si grades of ferro-silicon are receiving moderate support, while the demand for ferro-chrome and calcium silicide is at quite a reasonable level.

Steady interest is maintained in supplies of ferro-manganese and silico-manganese and there has been a slight revival in the demand for ferro-niobium.

### Semi-finished Steel

Overall demand from the re-rollers for small bars and light sections continues moderate and, in consequence, outputs are well below productive capacity. Any orders placed are speedily completed, the main difficulty experienced being in obtaining sufficient tonnage to make up rolling programmes.

There is little forward booking being done and even the demand for reinforcing rods has shown a tendency lately to decline.

### Finished Steel

Stocks held by consumers must have been even greater than was estimated as the general tendency in most sectors still is to draw on stocks. Such orders as are being placed are for items not held in stock. The position in regard to sheet and strip, small angles, flats, and rounds remains unchanged with little prospect of immediate improvement.

Makers of flat and corrugated galvanized sheets and those dealing in special alloy and high carbon steels are holding their own, but that is far from having enough business to test productive capacity. As neither the National Coal Board nor British Railways are ordering anything like past requirements of steel, makers catering for these industries are finding business very slack.

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MANUFACTURERS of the Staffa range of pipe, bar and section benders and also hydraulic equipment, Chamberlain Industries, Limited, London, E.10, has appointed Iino Sangyo Kaisha, Limited, Osaka Branch, Shin-Osaka Building, No. 25, 1- Chome, Dojima-Hamadori, Osaka, Japan, to represent it in Japan for the sales of specified benders from the Staffa range.

## Steel Price Changes

CHANGES in the maximum prices of some iron and steel products are announced to come into force on Monday, November 6; they have no significant effect on the overall level of steel prices.

Increases are authorized for steel products containing molybdenum following an increase in the price of ferro-molybdenum, and the price structure for hot-rolled carbon steel strip has been revised, leading in general to higher prices for the thicker material in all widths and lower prices for thinner material in widths of 2 in. to 6 in. Some consequential increases have been authorized in the prices of the thicker gauges of cold rolled strip.

A new schedule has been prepared for tinplate and blackplate so as to consolidate the increase of 1 per cent. authorized in June and the increases which took place on October 1 following the operation of the automatic tin price formula. This formula permitted basic increases of 5d. a box hot dipped and 1d. a box electrolytic tinplate. The schedule is being re-issued for purposes of clarity and does not represent a change in the existing price level of the products concerned.

In August, the ferro-molybdenum price was increased from £1,437 to £1,577 a ton after having remained stable during the previous two and a half years. Although the molybdenum content of special steels is usually small, the high price of the alloying material has a significant effect on the cost of molybdenum-bearing steels. Alloy steel black bars specification EN16 (molybdenum 0.20 to 0.35 per cent.) go up from £71 19s. to £72 11s., and Specification EN27 (molybdenum 0.20 to 0.65 per cent.) from £113 11s. to £114 13s.

Hot-rolled carbon steel strip 3 in. by 17 g., now £45 5s. 6d. per ton, will be priced at £44 9s., whereas 18 in .by $\frac{5}{16}$ in. goes up from £41 2s. 2d. to £41 19s. Cold-rolled steel strip 18 in. by 10 g. is increased from £56 11s. 3d. to £57 15s.

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## *Hadfields' New Steel Plant*

PLANT for the production of vacuum melted steel by the consumable electrode process is expected to be installed at the East Hecla, Sheffield, works of Hadfields, Limited, early this month. Supplied by Stein & Atkinson, Limited, the plant is of Lectromelt design and is claimed to have the largest capacity of any unit of its kind in Europe. It will be capable of making ingots of various sizes and weights up to 30 in. diameter and 20,000 lb.

Another new plant is planned to be opened at Hadfields' East Hecla works early next year. It will extract gases from liquid steel made in conventional furnaces.

*Coalfield News*

# Mines Rescue Competition in West Midlands

WINNERS of the championship shield in the finals of the mines rescue competition held by the West Midlands Division of the NCB at Birmingham University last Saturday were:—Littleton No. 1 Colliery (Cannock Chase Area); runners-up, Birch Coppice (Warwickshire). Third and fourth places were taken by Highley No. 2 (South Staffs and Shropshire), and Parkhall (North Staffs).

Birch Coppice had won the championship for the previous five years. Littleton, who were also finalists for the seventh time, had won once and been runners-up four times. Highley had won once in three appearances, and Parkhall were in the final for the first time.

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COAL FIRES are to replace oil heating in the £70,000 miners' club at Bilsthorpe (Notts).

AFTER 49 YEARS in the coal-mining industry, Mr. Bruce McCall, an overman at Horden Colliery (Co. Durham), has retired.

ANOTHER 150 HOUSES for miners are planned for Cotgrave (Notts). Application for planning permission is being made by the Coal Industry Housing Association.

## COAL PRODUCTIVITY RECORD

**At 30.14 cwt., overall, and 86.06 cwt. at the face, coal output per manshift in the week ended October 21, reached its highest level in the history of the British coal-mining industry. It has been steadily rising since the first week in September. The new record is 1.5 cwt. (overall) and nearly 5 cwt. (at the face), above the comparable week last year and 1.5 cwt. and 3.3 cwt. better than the average for the year.**

MURTON COLLIERY (Co. Durham) surface official, Mr. John W. Potts, has retired. He was shift engineer at the colliery for 14 years and then 22 years superintendent of the pithead baths.

LISTENERS TO the B.B.C. North of England Home Service at 9.15 p.m. next Friday will hear "miners talking about the present state of the industry, and their own attitude to the work, its dangers, its rewards, and its problems."

DURHAM MINERS' LEADER, Mr. Sam Watson, said recently that if the Government interfered with the progress of the current pay claim it would face "a first class internal crisis" so far as the coal industry was concerned.

AT AYR SHERIFF Court on Monday, Archibald Gilchrist (54), admitted embezzling £123 6s. 6½d. while employed as a baths superintendent at Killochan Colliery, Dailly, between January, 1960, and August this year. He was remanded for a week.

WARSOP (Notts) Urban District Council has decided not to build a 600-house estate for miners who come into the district, or to provide grants towards the cost. Instead it will let the National Coal Board build its own houses, and has granted planning permission.

AT MORTON COLLIERY (Derbyshire) where the Deep Hard Seam was exhausted 20 years ago, the shaft has been filled in and the head gear taken down. Morton No. 6 shaft was sunk by Clay Cross Company, Limited, in 1874 and the Deep Hard Seam worked until the 1940s.

COAL AND COKE shipments from the South Wales ports were curtailed last week due to the weather and the total of 49,947 tons was the smallest since the summer holiday period. It compared with 57,237 tons in the previous week and with 71,239 tons in the corresponding period last year.

A SCHEME is being considered to move the South Celynen coal tip, at Newbridge (Mon), and level the 15-acre site for industrial purposes. The waste material from the tip will be used to fill up a valley to make playing fields, and coal gathered from the tip will be sold. It is estimated that the tip contains about 2,000,000 cu. yds. of material.

IN ORDER TO gain knowledge of a miner's work and his working conditions, the Rev. W. J. Atkinson spent two hours underground at Deep Pit, Hanley (Staffs) last week. The visit, he said, was to provide him with "atmosphere" before conducting the seventh annual Mineworkers' Service at Providence Methodist Church, Upper Hanley, last Sunday.

AT THE FENTON (Staffs), inquest on Mr. Samuel Davies (64), a miner, who was fatally injured when struck by runaway pit cars while working at Florence Colliery, near Stoke-on-Trent, the jury returned an open verdict, and added a rider that further investigation was required and more examination to ensure that the safety precautions concerning derricks were complied with.

PROGRAMME FOR 300 new houses to accommodate workers at Brynlliw Colliery, Grovesend, has been agreed in principle by Llwchwr Urban District Council. The council's proposal follows a request from the NCB for housing accommodation which it is hoped will help to solve the manpower problem at the newly-opened pit. Some miners transferred to Brynlliw have to travel between 20 and 30 miles to the pit.

TENTATIVE PROPOSAL by the National Coal Board to build a Lurgi gas-producing plant in north Derbyshire, which would have a greater output than any other gas works in the UK, has been greeted with concern by the Derbyshire County Planning Committee. The plan is to build the plant close to Langwith Colliery, near Mansfield, on the Derbyshire-Nottinghamshire border, and to pipe gas from there under high pressure to the London area.

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# Scottish NCB Concerned at Increased Accident Rate

CONCERN about the continued increase in colliery accidents is expressed by the Scottish Divisional Coal Board and trade union officials in a letter distributed with wage packets last weekend to miners, craftsmen, and other colliery workers. The letter states that despite a variety of accident prevention activities at collieries "the results in the main have been disappointing and much more must be done."

A further intensive campaign is being launched immediately throughout the division.

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ANNUAL MEETING of the Gauge and Tool Makers' Association will be held this year on Tuesday, December 12, at the Connaught Rooms, London, W.C.2. During the following luncheon, prizes and certificates will be presented in the association's ninth competition in craftsmanship and draughtsmanship for apprentices and learners employed with member-firms.

# THE COAL TRADE

IN most areas increased pressure for delivery of household coals marked the ending of the summer price concessions and merchants have made a valiant effort to fulfil all orders at the lower prices. There has been a certain amount of carry-over into November but this has not been as large as might have been expected, especially where customers were willing to accept alternative grades to those specified. Business may now quieten down a little in this section of the market, but there is little likelihood of much relief of the pressure for smokeless fuels. It is one thing for the authorities to announce that supplies of such fuels are plentiful—it is another matter entirely to persuade the customer that there are alternatives to anthracite and some of the scarcer manufactured fuels.

### DURHAM AND NORTHUMBERLAND

While output per manshift at the pits has increased, there has been a fall in overall production, and the result on the market has meant that output and demand have found an equilibrium which, for most descriptions, has brought stability. Durham and Northumberland steams, especially superior classes, are firm, but Durham coking coal is an easy market and output at present is not as readily cleared as it was before the easier period in iron and steel. Durham gas coal is quite a steady trade.

The coal industry's financial position, however, has set the market wondering about the future trend in prices, particularly on the export side, and the outlook is not regarded with much optimism.

### NORTH WALES

Receipts of house coal are in line with contract tonnages, and while many qualities are being substituted, adequate supplies are on hand. There was no great rush for supplies before the winter prices came into operation, most consumers having been sensible, and laid in stocks during the summer months. The market for Sunbrite is very subdued, as most consumers have good stocks.

All grades of anthracite continue to be exceptionally scarce, but arrivals of Phurnacite have improved over the past few weeks. The call for premium smokeless fuels is very strong, with orders for Coalite several weeks in arrear. Industrial undertakings are catered for satisfactorily and the demand is likely to increase as central heating gets under way.

## Coal Delivered by Hosepipe

NEW vehicle for the delivery of coal by hosepipe has been developed by the East Midlands Division of the NCB. It was used for the first time on Wednesday when a coalman wearing a white coat delivered coal to a public house in Leicester. An NCB official said: "Technicians at our control machinery depot saw a lorry being used to pipe cattle food into farmers' silos. They decided that the idea had possibilities for the delivery of small industrial coal. It worked perfectly."

By means of a compressed air mechanism it is possible to blow the coal through 120 ft. of hosepipe. The £4,000 coal tanker can deliver at the rate of a ton every three minutes. Its main use will be to deliver coal to factories which in the past have had to use lifts to hoist the fuel into bunkers.

## Coal Output Rate Still Increasing

COAL output is creeping up gradually towards the 4,000,000-ton mark. Last week's total output was less than 25,000 tons short of the target. At this rate, annual output would exceed the 200,000,000 tons looked for by Lord Robens, but at the average rate for the first 43 weeks of 1961 the final figure is likely to be about 190,000,000 tons.

Consumption is running at almost 3,800,000 tons with consumer's stocks still increasing. They now stand at 17,672,000 tons, compared with 14,582,000 tons a year ago. Undistributed stocks are still almost static at just under 22,500,000 tons.

There were 561,880 wage-earners on colliery books on October 21, against 586,530 on October 22, 1960, the numbers engaged at the coal face being 210,270 and 221,600 respectively. Total absenteeism (all workers) in the week ended October 21 was 15.37 per cent., compared with 14.60 per cent. in the week ended October 22, 1960. Output at the face was 4.303 tons and overall 1.507 tons in the week ended October 21, compared with 4.064 and 1.431 tons in the week ended October 22, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended October 28, and the tonnage lost through disputes:—

| Division. | Week ended October 28, 1961. | | Week ended October 29, 1960. |
|---|---|---|---|
| | Total output. | Tonnage lost. | Total output. |
| Scottish .. | 361,000 | 4,000 | 352,000 |
| Northern (N&C) .. | 242,000 | 1,000 | 246,000 |
| Durham .. | 464,000 | — | 464,000 |
| North-Eastern .. | 836,000 | 3,000 | 808,000 |
| North-Western .. | 245,000 | 1,000 | 262,000 |
| East Midlands .. | 933,000 | 1,000 | 889,000 |
| West Midlands .. | 290,000 | 1,000 | 276,000 |
| South-Western .. | 367,000 | 3,000 | 382,000 |
| South-Eastern .. | 31,000 | — | 29,000 |
| Great Britain— | | | |
| Deep-mined coal .. | 3,769,000 | 14,000 | 3,708,000 |
| Open-cast coal .. | 162,000 | — | 115,000 |
| Other deep-mined (including licensed mines) .. | 45,000 | — | 40,000 |
| TOTAL .. | 3,976,000 | 14,000 | 3,863,000 |

PULSOMETER PUMPS, LIMITED—Mr. Leslie Davies has been appointed to the board as works director.

*Obituary*

# Dr. B. L. Goodlet: Pioneer of Atomic Reactors

ONE of the two men chiefly responsible for the design of the first British atomic power reactors, Dr. BRIAN LAIDLAW GOODLET, who was vice-chairman and, until July, managing director of Brush Electrical Engineering Company, Limited, died last Friday at the age of 58. Born in St. Petersburg and educated in Russia, at Sheffield University and St. John's College, Cambridge, he had his engineering training with Vickers, Limited, in Sheffield, and Metropolitan-Vickers Electric Company, Limited, Manchester, with whom he was later technical assistant and research engineer.

He went to South Africa in 1937 as Professor of Electrical Engineering at Cape Town University, retaining the chair, with the exception of war service, until 1950. He returned to this country to head the Engineering Research and Development Division at Harwell in 1950. He left the Atomic Energy Research Establishment in 1956 to join the Brush Electrical Engineering Company as chief engineer and director, becoming managing director the following year. He was also a director of Hawker Siddeley Industries, Limited, and of Hawker Siddeley Brush Turbines, Limited.

Dr. Goodlet's various awards included the Thomas Hawksby Gold Medal of the Institution of Mechanical Engineers; Kelvin and Overseas Premiums of the Institution of Electrical Engineers; and the Trevithick Premium of the Institution of Civil Engineers. He was made OBE in 1944.

### MR. G. O. SYLVESTER

LABOUR MP for Pontefract for the past 11 years, Mr. GEORGE OSCAR SYLVESTER, who until he entered Parliament was a mineworker at Sharlston West Colliery, near Wakefield, and a miners' branch official, died in a Wakefield hospital last week after being taken ill at his home in Normanton. He was 63.

Mr. Sylvester, who began work in the pits when he was 13, first entered Parliament in 1947 in the old Normanton division. He was a member of Normanton Urban Council for 20 years and three times its chairman, and also served on the old Normanton Education Committee and other public bodies. He was a member of the Labour party's fuel and power group.

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Chairman of Amalgamated Anthracite Holdings, Limited, since 1948 and chairman of the Projectile & Engineering Company, Limited, Mr. JOHN WADDELL has died at his Berkshire home at the age of 81.

The death has occurred of Mr. WILLIAM BOYERS, former buyer at the ironworks of Ruston & Hornsby, Limited, Lincoln. Mr. Boyers, who was 87, joined Ruston & Hornsby in 1911 and retired in January, 1959.

Ald. EDWARD SLATER, managing director of Slater & Crabtree, Limited, press tool makers, of Wakefield (Yorks), has died while on a Mediterranean cruise. He was a Freeman of the city, and a former Mayor of Wakefield.

The death took place last week of Col. R. T. HARTMANN, managing director of Materials Handling Equipment (G.B.), Limited, a pioneer in the introduction of fork lift trucks into this country after the last war. He was the founder of I.T.D., Limited (manufacturers of "Stacatrucs"), which was ultimately taken over by the Austin Motor Company, Limited, and Crompton Parkinson, Limited. In 1952 he established MHE, which is now a member of the Hunslet group of companies, and he was for some years sales and executive director of British Straddle Carrier Company, Limited.

Assistant transport officer at the control depot of Richard Thomas & Baldwins, Limited, at Swansea for more than 20 years, Mr. ARTHUR H. JONES died recently. He was a member of Swansea Borough Council for seven years.

The death has occurred at the age of 74 of Mr. GEORGE BUCHAN, a well-known figure in West Fife mining circles. He was manager at Benarty Mine before his retirement and afterwards became a teacher at Cowdenbeath Technical College.

The death took place last week of Mr. ARNOLD M. FOSTER, a former general manager of the North Central Wagon & Finance Company, Limited, Rotherham. He was 71 and had completed 50 years with the company not long ago. He became its secretary in 1946. He resigned as general manager in 1957 but remained on the board.

Mr. JOHN MATHIESON, of Lochgelly (Fife), who has died at the age of 84, was not yet 12 when he started work in the mines. During his 55 years' service he rose to become undermanager at the old Lochhead Pit. He retired in 1946. In 1925 he was presented with the Carnegie Hero Fund Certificate in recognition of "a heroic bid to save human life."

The death has occurred suddenly at Harrogate (Yorks) at the age of 63, of Mr. ALEXANDER HYND, founder in 1933 of Mechanical Equipments, Limited, structural and mechanical handling engineers, of Leeds. Managing director of the company until his retirement two years ago, he was also a director of the Reid Gear Company, Limited, gear cutters, of Paisley (Renfrew).

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# RTB Loses £6,000 Rating Appeal

AS a result of losing a rating appeal, more than £6,000 in back-dated rates will have to be paid by Richard Thomas & Baldwins, Limited, for temporary offices and other premises at the site of the new Spencer steelworks at Llanwern (Mon). This was decided by a Valuation Court at Newport (Mon), on Tuesday, after it was said that the company was already paying the rates of other contractors amounting to between £15,000 and £20,000 a year.

The firm was objecting to the contention of the Newport area valuation officer that rates were payable on offices and premises at the steelworks site hereditament, not at present included in the valuation list. They claimed that rates should not be charged until the works started production.

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## *Training for Management*

WITH the aim of producing men and women in senior managerial positions, skilled in communications with employees and the public, the Institute of Directors hopes to start the first of its management courses next autumn. According to the Institute's director-general, Sir Richard Powell, the courses will cover "what in less complicated days used to be described as 'letting others know what you are doing and why you are doing it'."

Each course will last eight weeks and will be held in London. A fee of £150 is proposed. Although the course will be of post-graduate standard no formal educational qualification will be required.

## *The Scrap Markets*

# Export Freedom

### EASING OF BAN ON CERTAIN GRADES

ACTING at the request of the Ministry of Power, the Board of Trade has eased the ban on exports of iron and steel scrap. An open general licence permitting certain exports has been issued effective from the end of last month to February 28 next. The licence covers shipments "to any destination" of compressed baled iron and steel scrap and exports of iron and steel scrap turnings and borings, but in each case the shipment must not exceed an f.o.b. value of £25 per ton. Commenting on the move, a spokesman for the British Iron and Steel Federation said that in effect the arrangement excluded the export of the dearer alloy scraps.

The relaxation of the ban will receive partial welcome by members of the National Federation of Scrap Iron, Steel and Metal Merchants, many of whom have felt for some time that only freedom to export all surplus grades of ferrous scrap would solve the problem of growing stockpiles resulting from the reduced demand from steelworks in this country.

At a recent meeting with the British Iron and Steel Federation to discuss the question of exports, officials of the Scrap Federation were handicapped by the lack of convincing merchant stock figures. The problem as seen by the steelmakers was that the position was not national, and that many of the difficulties of merchants could be attributed to conditions in some localities only.

#### Steelworks' Restricted Intake

Since then, the overall position has deteriorated further. Intake of scrap by steelworks and blast furnaces continues to be on a restricted scale and stocks in scrap merchants' yards have been increasing week by week. Consumers' labels are being issued on the usual strict allocation basis which shippers dare not exceed. The steelworks' policy on acceptances has received much criticism but there appears to be little that merchant processors can do to change the situation.

The steelworks refuse to stockpile scrap to any great extent and expect the merchant traders to do this for them. Should Britain join the Common Market, domestic consumers of ferrous scrap may no longer be able to place the onus for stocking scrap on UK merchants. They will presumably have to buy at European market prices, which are on the whole higher than the UK price, and will no longer be certain of procuring the first-grade, well-processed British scrap upon which they have always had first call.

One bright spot at the moment is that orders taken at the recent London Motor Show have exceeded manufacturers' hopes. This in turn should soon be reflected in the order-books of sheet suppliers.

Ferrous scrap imports into the UK during August declined still further to 4,182 tons (£56,295) against 57,082 tons in the same month last year. Total for the eight months to the end of August amounted to 16,882 tons (£315,533) against 154,817 tons (£2,550,260) in the corresponding period of 1960.

## *Tap & Die to Acquire Machine Tool Firm*

THE machine tool division, including the works, of Smart & Brown (Machine Tools), Limited, Biggleswade (Beds), a subsidiary of Gas Purification & Chemical Company, Limited, is to be purchased by the Tap & Die Corporation, Limited, for £300,000 in Tap & Die ordinary shares. The electrical components division of Smart & Brown is being retained by Gas Purification and will temporarily continue to occupy part of the present buildings, pending completion of new premises. It will change its name to Sabel Connectors, Limited.

Mr. A. H. Carding, the works director, and Mr. P. E. Verrall, the machine tool sales director, will resign from the board of Sabel Connectors. All existing orders for machine tools will be carried out by the subsidiary of Tap & Die.

Mr. D. G. N. Lloyd-Lowles, chairman of Tap & Die, states that the corporation's turnover is currently running at a rate well in excess of the corresponding period las year, and profits should again be higher.

## More Ore Through Welsh Ports

IMPORTS of iron ore through the South Wales ports in the four weeks ended October 8 rose to 348,792 tons, an increase of 13,000 tons compared with the same period last year, while imports of iron and steel goods fell by 30,000 tons to 14,687 tons. There was also a fall in imports of pitwood and mining timber from 30,739 tons to 27,457 tons. Exports of coal, coke and patent fuel rose by 47,000 tons to 269,463 tons, and those of iron and steel manufactures by 41,000 tons to 64,335 tons. Exports of tinplate were little changed at 30,956 tons.

Total traffic passing through the various ports during the period, with the figure for the corresponding period last year in parentheses, was: Newport 193,543 (182,551) tons; Cardiff, 175,501 (155,033) tons; Barry, 146,161 (106,779) tons; Port Talbot, 279,812 (266,648) tons; Swansea, 485,966 (569,002) tons; Penarth, 21,389 (22,284) tons; Lydney, 2,935 (2,294) tons.

*Orders Placed*

# Wellman Smith Cranes for UK Steelworks

LARGE influx of orders for heavy duty cranes and special steelworks handling machines to a total value of more than £1,500,000 has recently been received by the Wellman Smith Owen Engineering Corporation, Limited. Included in the contracts are five ladle cranes ranging from 100/150 tons capacity, and a 200-ton Goliath crane, all of which are for steelworks schemes in the UK.

The Corporation also reports an increased demand for its mobile forging manipulators and mobile charging machines, further export orders having recently been booked from Australia, France, Czechoslovakia, Spain, Sweden, and Japan.

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AN ORDER for coal handling plant for the West Burton power station, has been received by Birtley Engineering, Limited, Co. Durham, from the Central Electricity Generating Board.

AN ORDER, worth £170,000, for irrigation pumping plant and machinery has been placed with Mather & Platt, Limited, Manchester, by the Ministry of Irrigation and Hydro-electric Power, Sudan Republic.

VALUED AT ABOUT £3,500, four 10-ton 16 in. lift hoists have been ordered by Guest Keen Iron & Steel works, branch of the G.K.N. Steel Company, Limited, Cardiff (Glam), from Matterson, Limited, Rochdale (Lancs). The hoists will be used by Guest Keen Iron & Steel, at its East Moors plant to reline the four blast furnaces.

CHASESIDE ENGINEERING COMPANY, LIMITED, has just despatched a further five Loadmaster 1000 4-wheel drive loading shovels to Santiago del Estero, Argentina. Part of a £1,500,000 contract for British Construction Equipment, Limited, the order was secured by Mercator, SA, of Buenos Aires, and Knowles & Foster, Limited, London.

ORDER has been received by GEC (Engineering), Limited, from Millspaugh Wimpey, Limited, for a 7mW double-passout condensing turbo-generating set for installation in a pulp and paper mill at Plaski, Yugoslavia. Valued at about £130,000 it forms part of a £3,000,000 contract which Millspaugh Wimpey has received for plant for the same mill.

CONTRACT worth about £800,000 has been placed by Brown Bayley Steels, Limited, with the Brightside Foundry & Engineering Company, Limited, for a 32-in. blooming mill and reconstruction of the existing 28-in. finishing mill at its Attercliffe works. The plant will provide increased output and size range of the company's high quality alloy and stainless steels.

THE Power-Gas Corporation, Limited, a member of the Davy-Ashmore group, has received an order for a large $CO_2$ removal plant to be installed at the Severnside Works of Imperial Chemical Industries, Limited. The plant, the second operating with the Benfield hot potassium carbonate process to be constructed for ICI by Power-Gas, is scheduled for completion early in 1963.

AN ORDER for furnaces from Centrozap of Poland to the value of £153,000, has been received by AEI-Birlec, Limited. The contract calls for the supply of two continuous twin-track, gas-fired gas carburizing furnaces, each to give an output of 300 Kgs per hour. They will be used chiefly for the heat treatment of gears and other components required in the manufacture of tractors.

# New Managing Director of W. C. Holmes

CHAIRMAN and managing director of W. C. Holmes & Company, Limited, gas and chemical engineers, ironfounders, etc., of Huddersfield, Mr. F. Brian Holmes has retired as managing director and is succeeded by Mr. A. J. M. Henshaw. Mr. Henshaw joined the company in 1946 and was appointed to the board in 1953. He became assistant managing director in 1960.

MR. A. J. M. HENSHAW

Mr. Holmes joined the company in 1922 and was appointed to the board in 1923. He became joint managing director with Mr. D. M. Henshaw in 1941, and chairman of the company on Mr. Henshaw's death in 1953. Mr. Holmes will retain his position as chairman of the company, of the holding company, B.H.D. Engineers, Limited, and of those member companies of which he is chairman.

Dr. W. T. Cosby, who joined W. C. Holmes in 1950 and became manager of the gas cleaning division in 1957, has been appointed a director.

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# Full Production at SCOW Steelworks

FOLLOWING last weekend's surprise settlement of the labour dispute at the Abbey and Margam works of the Steel Company of Wales, Limited, at Port Talbot (Glam), which made 15,500 men idle during the 16-day shut-down, full production of steel is expected by today (Friday). Production began again on Sunday and on Monday Nos. 1, 2, and 3 blast furnaces, damped down during the closure, started producing iron.

Normal working at Velindre, near Swansea, and at another of the company's tinplate works at Trostre, near Llanelly, will be possible next week only if deliveries of steel build up quickly. The majority of the employees have had notices rescinded.

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# *Fair Play Needed in Dispute Says Steel Firm Chief*

JUSTICE and fair play must be the rule in dealing with disputes between management and men, said Mr. Cecil Hurst, deputy chairman of Samuel Osborn & Company, Limited, when he spoke on management at a luncheon of the Sheffield Exchange (Coal, Steel, Iron and Allied Trades), of which he is president. Workmen and staff were often irritated in cases of dispute when there was delay and inferred indifference in dealing with complaints, he said.

"One should never be afraid to give an apology when error has been proved, but to be 80 per cent. just with speed is better than being 95 per cent. right too late," he added.

# NEWS IN BRIEF

OWING TO a shortage of orders, 60 men employed at the Jarrow works of Armstrong Whitworth & Company, Limited, on the making of castings, have been placed on a four-day week.

FORMERLY USED in plain colours, Stelvetite—plastics laminated to steel—made by John Summers & Sons, Limited, has now been introduced in patterns comprising the entire range held by the Calico Printers' Association.

J. D. TRACTORS, LIMITED, sole concessionaires in England and Wales for John Deere-Lanz equipment, has appointed Bristol Plant Hire, Limited, as sales and service dealers for Hampshire, West Sussex, and eastern Dorset.

THE CURRENT INSTALLATION of new plant and equipment at the works of Goodwin, Barsby & Company, Limited, stone crushing and quarry plant manufacturers, of Leicester, has been completed by the installation of a 200-ton hydraulic press-brake for bending steel plate.

THE department of operational research and cybernetics of the United Steel Companies, Limited, is now known as the department of operational research. Study of cybernetics will continue as part of the work of the department and its application will be an integral part of operational research.

EMPLOYEES OF Qualcast, Limited, ironfounders, manufacturers of lawn mowers, etc., of Derby, have been inoculated against influenza. The company is bearing 50 per cent. of the cost. The firm claims that its figures for absenteeism are among the most favourable in the whole of the ironfoundry trade.

ALL PERSONNEL on the engineering side involved with the design and manufacture of press brake guards by Rubery, Owen & Company, Limited, have been transferred to Boucher & Company, Limited, Kidderminster, which will now carry out manufacture, erection, and servicing of the press brake guard.

NEW COMPANY which will manufacture vehicle electrical equipment to meet the demand of the rapidly expanding Indian motor industry, has been formed between Joseph Lucas (Industries), Limited, Birmingham, and T. V. Sundaram Iyengar & Sons (T.V.S.), of South India. The new company will be known as Lucas-T.V.S. (Private).

ARGENTINE import tax and surcharges on steel billets and slabs are to be raised to about $30 a ton from approximately $13, it was officially announced in Buenos Aires. The new measures, which are aimed at protecting the national industry and particularly the Government's plant at San Nicholas, are expected to become effective shortly.

FUND SET UP by Ebbw Vale Trades and Labour Council for the 14 dependants of the seven men who died in an explosion at the Ebbw Vale works of Richard Thomas & Baldwins, Limited, has been closed at £1,248. A grant of £70 was made to each family in August, and between £150 and £200 is now to be allocated to each family.

CHAIRMAN OF Turners Asbestos Cement Company, Limited, Mr. Kenneth Neve opened a £260,000 extension to the company's premises at Tamworth (Staffs), last Friday. This is the first phase of a £700,000 redevelopment scheme under which the whole of the factory is to be pulled down and rebuilt, so that output capacity will be doubled.

MAIN SUBSIDIARY of the Broken Hill Proprietary Company, Limited, Australian Iron & Steel, Limited, has brought into commission its second electric arc furnace at Port Kembla steelworks, NSW. The unit cost £A750,000 to build and has an annual steelmaking capacity of more than 60,000 tons. Output will be used to make special quality steels.

A PARTY of 36 boys, school-leavers from the senior form of the Cecil Rhodes School, Wood Green, visited the Palace Gates solid fuel depot, and the Poplar oil terminal of Charrington, Gardner, Locket, Limited, last week. During the visit the boys were addressed by Mr. F. W. Brinkman, and Mr. S. Scofield, directors, and Cmndr. A. S. Jackson, head of Charringtons' staff department.

NEW STEEL WAREHOUSE at the Wednesbury (Staffs) works of Steel Nut & Joseph Hampton, Limited, nut, bolt and bright drawn steel manufacturers, was officially opened last week by Lord Piercy, chairman of the Industrial Development and Finance Corporation. Designed to hold 1,400 tons of bright drawn steel in a wide range of sizes and sections, it will enable the firm to meet orders from stock.

SOME 100 SENIOR British executives studied problems of increasing sales in France at a London School of Marketing seminar held this week. It was generally agreed that British firms could sell profitably in France only if they make a real effort to understand the market, and were willing to sell to French consumers the products they wanted at the right price using French sales and advertising methods.

ACTUAL PRODUCTION of raw steel in the United States during the week ended October 30 totalled 2,057,000 net tons, according to the American Iron and Steel Institute. This was an 0.7 per cent. increase compared with the 2,042,000 tons in the preceding week. Actual production in the current year to date totalled 78,721,000 tons—a rise of 8.5 per cent. on output over the corresponding period last year.

EXPORTS will be the theme of the 10th annual conference of the Scientific Instrument Manufacturers' Association of Great Britain, to be held from November 8-15 at the Grand Hotel, Eastbourne. A SIMA delegation left on Monday for Italy where it will explain the size and scope of the British scientific instrument industry and find out the needs of Italian research programmes and the main engineering and manufacturing industries

NEW BODY known as the Committee of Associations of Specialist Engineering Contractors has been set up to deal with matters of common interest to industries in specialist engineering work on building and civil engineering contract. Its founder members are the Association of Heating, Ventilating and Domestic Engineering Employers, the British Constructional Steelwork Association, and the Electrical Contractors Association (Incorporated).

UNDER THE TERMS of a manufacturing agreement signed in London on Monday between Chilton Electric Products, Limited, and the Westinghouse Electric International Company, a division of Westinghouse Electric Corporation, of the US, Chilton will be the exclusive manufacturers in the UK of Westinghouse moulded case circuit breakers, with non-exclusive sales rights for the rest of the world, with the exception of the US and Canada. As a result of the agreement, the Chilton company's works at Hungerford (Berks), will be expanded. It is revealed that the £115,000 privately-held share capital will be "going public" in about two years' time.

# *Coal Chartering*

ALTHOUGH there is no appreciable change in the general market position, certain sections are quieter. There is a somewhat reduced demand for coal from Hampton Roads to Japan and no particular activity is noticed from the Roads to Brazil. Two 12,000-tonners have been fixed from the Roads to Japan for November positions at $9.40 and similar size for December 1-28 also secured this rate and there are reports of a contract having been concluded over next year at $8.70, all this business being arranged with six days Shinc.

Some business has been concluded from the Roads to Italy and November tonnage has been fixed at $4.70. As far as the Continent is concerned there are reports of November tonnage having accepted 30s. 3d. to one port Holland-Belgium Range with possibilities of further business being arranged. Further tonnage has been taken up from Newcastle, NSW/Moji-Tokyo Bay Range basis 41s. 6d. f.i.o. and trimmed for 11,000 tons 5 per cent. November 25/December 20, and similar size for November/December 20 also at 41s. 6d. f.i.o.t. to Moji-Chiba Range including Amagasaki.

South Africa reports Durban to Matadi with anthracite for 8,500 tons at 47s. 6d. f.o.b., steamer discharging, November 4-25. Poland/Rio paid 43s. 6d. for 10,000 tons, middle November, and there is some inquiry for tonnage for discharge in Eire, while to the Mediterranean Gdynia-Gdansk to Genoa-Savona paid 34s. for 7,700 tons, prompt loading. Bremen/Djakarta-Semarang and Sourabaya reports 9,500 tons at 82s. 6d. f.i.o., 2,000/700 tons, November/December.

## Russian Coal Industry is Highly Mechanized

DURING the past 20 years the Russian coal-mining industry has made great strides and today is efficient and highly mechanized, said Mr. A. H. Morris, of the National Coal Board Central Engineering Establishment, speaking recently to Chesterfield Rotary Club on a visit he had paid to the Russian coalfields. Russian mining was organized on similar lines to our own, he added, but was much larger and had output two and a half times as great.

In particular the Russians possessed well-equipped research facilities, but he did not consider their engineering standards equal to this country's. The Russian industry had a good deal of open-cast mining, but 90 per cent. of the output was deep-mined.

## RICS MINING SURVEYING EXAMINATION

AMONG successful candidates in the Royal Institution of Chartered Surveyors' final examination (autumn), 1961, are the following in the mining surveying section:—

Mr. E. Bailey, Survey Department, NCB, Stoke-on-Trent; Mr. Brian Donnelly, Survey Department, No. 5 Area, Durham Divisional Coal Board; Mr. Peter Grant, Survey Department, Wombwell Main Colliery, and Mr. D. N. Thornley, Survey Department, No. 3 Area, both in the North-Eastern Division of the NCB; Mr. R. W. Willson, Survey Department, Birch Coppice Colliery, West Midlands Division of the NCB.

# European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

| Country. | Output. | | Underground employment. | |
|---|---|---|---|---|
| | July, 1961. | June, 1961. | July, 1961. | June, 1961. |
| Belgium .. .. | 1,381,000 | 1,947,000 | 70,000 | 71,000 |
| France .. .. | 3,670,000 | 4,370,000 | 119,000 | 121,000 |
| Italy .. .. | 66,000 | 60,000 | — | — |
| Netherlands .. | 982,000 | 1,038,000 | 27,000 | 28,000 |
| Poland .. .. | 8,518,000 | 8,609,000 | 211,000 | 212,000 |
| United Kingdom .. | 13,311,000 | 19,265,000 | 451,000 | 454,000 |
| Spain .. .. | 1,082,000 | 1,138,000 | — | — |
| Western Germany .. | 11,234,000 | 11,834,000 | — | 288,000 |

TABLE 2.—*European Solid Fuel Imports in July*, 1961, *with Figures for June*, 1961, *shown in Brackets (Metric Tons).*

| Importing country. | Coal and patent fuel. | Coke. | Lignite and brown coal briquettes. |
|---|---|---|---|
| Austria .. .. .. | 269,000 | 65,000 | 52,000 |
| | (264,000) | (69,000) | (36,000) |
| Belgium .. .. .. | 356,000 | 23,000 | 8,000 |
| | (349,000) | (24,000) | (8,000) |
| Denmark .. .. .. | 337,000 | 137,000 | 8,000 |
| | (350,000) | (112,000) | (4,000) |
| Finland .. .. .. | 231,000* | 10,000* | — |
| | (247,000) | (7,000) | (—) |
| France .. .. .. | 946,000 | 471,000 | 44,000 |
| | (1,067,000) | (453,000) | (39,000) |
| Greece .. .. .. | 23,000* | 4,000* | — |
| | (9,000) | (1,000) | (—) |
| Eire .. .. .. .. | 168,000* | — | — |
| | (147,000)* | (1,000)* | (—) |
| Italy .. .. .. | 768,000 | 11,000 | 18,000 |
| | (846,000) | (9,000) | (16,000) |
| Luxembourg .. .. | 18,000* | 350,000* | 11,000* |
| | (18,000) | (346,000) | (11,000) |
| Netherlands .. .. | 612,000 | 20,000 | 18,000 |
| | (516,000) | (26,000) | (40,000) |
| Norway .. .. .. | 50,000* | 25,000* | — |
| | (48,000)* | (35,000)* | (—) |
| Portugal .. .. .. | 33,000 | 15,000 | — |
| | (53,000) | (9,000) | (—) |
| Sweden .. .. .. | 93,000 | 129,000 | — |
| | (180,000) | (163,000) | (—) |
| Switzerland .. .. | 153,000 | 53,000 | 18,000 |
| | (166,000) | (58,000) | (17,000) |
| United Kingdom .. .. | — | — | — |
| | (—) | (—) | (—) |
| Western Germany .. .. | 612,000 | 28,000 | 405,000 |
| | (519,000) | (26,000) | (384,000) |

* Secretariat Estimate.

## *Northern Fuel and Power Exhibition for* 1963

THE Northern Exhibition of Fuel and Power for Industry—in future to be known as the National Exhibition—is to be held again at the Queens Hall, Leeds, in the autumn of 1963. Exhibitors at this year's show have agreed to its continuance on a biennial basis, "to meet a real need in the industry."

Substantial business was booked at the recent exhibition, it is stated, and inquiries received from as far afield as Ghana, Malaya, Turkey, and Norway.

TARMAC ROADSTONE, LIMITED—Mr. D. G. Sillars has been appointed a director.

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AP 81

# *Imports and Exports of Iron and Steel*

FIGURES of imports and exports of iron and steel in September are given in the following tables, based on the Board of Trade returns, and including totals for the first nine months of 1960 and 1961.

### *Total Exports of Iron and Steel*

| Destination. | Month ended Sept. 30. | Nine months ended September 30. | |
|---|---|---|---|
| | 1961. | 1960. | 1961. |
| | Tons. | Tons. | Tons. |
| Malta | 607 | 4,556 | 4,072 |
| Sierra Leone | 318 | 4,731 | 7,502 |
| Ghana | 1,316 | 16,650 | 12,969 |
| Nigeria | 2,919 | 45,705 | 53,242 |
| Union of South Africa | 1,852 | 51,019 | 44,234 |
| South-West Africa | 681 | 5,025 | 12,032 |
| Rhodesia and Nyasaland | 1,655 | 19,894 | 23,435 |
| Tanganyika | 3,251 | 11,213 | 22,775 |
| Kenya | 2,542 | 22,780 | 30,371 |
| Uganda | 58 | 1,050 | 1,873 |
| Mauritius | 15 | 4,012 | 1,461 |
| Bahrein, Qatar, and Trucial States | 593 | 11,026 | 14,302 |
| Kuwait | 413 | 5,041 | 17,243 |
| India | 11,420 | 200,679 | 150,327 |
| Pakistan | 3,353 | 51,816 | 65,510 |
| Singapore | 1,356 | 14,720 | 19,102 |
| Malaya | 1,389 | 14,160 | 20,159 |
| Ceylon | 1,823 | 39,445 | 29,331 |
| British North Borneo | 58 | 3,366 | 2,170 |
| Hongkong | 7,727 | 63,876 | 66,452 |
| Australia | 4,852 | 135,122 | 97,561 |
| New Zealand | 7,107 | 89,621 | 173,328 |
| Canada | 5,624 | 165,716 | 93,130 |
| Jamaica | 1,395 | 17,970 | 12,437 |
| Trinidad | 3,191 | 30,682 | 33,591 |
| British Guiana | 517 | 6,886 | 6,902 |
| Other Commonwealth countries | 2,568 | 20,770 | 23,307 |
| Eire | 5,816 | 46,285 | 57,044 |
| Soviet Union | 4,889 | 23,156 | 28,796 |
| Finland | 7,682 | 34,209 | 48,773 |
| Sweden | 11,015 | 130,541 | 123,072 |
| Norway | 9,366 | 84,219 | 100,095 |
| Denmark | 7,872 | 72,069 | 78,118 |
| Poland | 1,834 | 8,798 | 30,729 |
| Western Germany | 8,048 | 107,079 | 84,089 |
| Eastern Germany | 878 | 16,561 | 18,335 |
| Netherlands | 4,750 | 90,784 | 88,860 |
| Belgium | 1,329 | 25,843 | 24,446 |
| France | 836 | 5,688 | 9,709 |
| Switzerland | 2,105 | 10,284 | 17,332 |
| Portugal | 4,223 | 12,292 | 21,958 |
| Spain | 2,054 | 37,574 | 18,842 |
| Italy | 9,239 | 32,076 | 58,004 |
| Austria | 601 | 4,007 | 4,265 |
| Yugoslavia | 1,563 | 29,076 | 22,489 |
| Greece | 3,517 | 13,855 | 28,152 |
| Turkey | 129 | 11,576 | 11,725 |
| Netherlands Antilles | 96 | 2,781 | 1,353 |
| Portuguese East Africa | 95 | 3,536 | 1,901 |
| Egypt | 2,638 | 9,929 | 24,791 |
| Libya | 4,116 | 30,541 | 17,574 |
| Sudan | 875 | 7,256 | 7,675 |
| Israel | 1,608 | 15,155 | 17,806 |
| Saudi Arabia | 39 | 369 | 1,031 |
| Iraq | 1,221 | 32,560 | 26,395 |
| Iran | 3,235 | 48,876 | 27,316 |
| Burma | 1,698 | 4,801 | 5,263 |
| Thailand | 454 | 4,968 | 4,445 |
| Indonesia | 223 | 19,950 | 2,958 |
| China | 141 | 40,032 | 10,542 |
| Japan | 19,889 | 54,459 | 134,386 |
| Philippine Republic | 495 | 6,050 | 3,935 |
| USA | 11,604 | 164,996 | 98,113 |
| Cuba | 35 | 5,905 | 836 |
| Mexico | 269 | 4,917 | 3,104 |
| Colombia | 1,224 | 6,591 | 9,373 |
| Venezuela | 570 | 28,438 | 20,341 |
| Ecuador | — | 2,128 | 2,118 |
| Peru | 382 | 4,928 | 6,469 |
| Chile | 182 | 3,280 | 2,532 |
| Brazil | 266 | 22,838 | 13,387 |
| Uruguay | 701 | 6,677 | 7,015 |
| Argentina | 12,811 | 65,089 | 129,159 |
| Other foreign countries | 2,730 | 46,359 | 51,888 |
| TOTAL | 223,943 | 2,496,912 | 2,545,357 |

### *Total Imports of Iron and Steel*

| From | Month ended Sept. 30 | Nine months ended Sept. 30 | |
|---|---|---|---|
| | 1961. | 1960. | 1961. |
| | Tons. | Tons. | Tons. |
| Union of South Africa | 2,348 | 23,969 | 28,468 |
| Rhodesia and Nyasaland | 682 | 5,123 | 19,076 |
| Canada | 4,481 | 197,875 | 71,647 |
| Other Commonwealth countries and Eire | 749 | 37,958 | 34,676 |
| Soviet Union | 5,542 | 27,590 | 22,624 |
| Sweden | 3,346 | 35,223 | 36,313 |
| Norway | 8,083 | 119,464 | 84,706 |
| Poland | 179 | 8,370 | 831 |
| Western Germany | 1,688 | 108,907 | 19,826 |
| Netherlands | 10,007 | 153,342 | 87,312 |
| Belgium | 2,280 | 91,663 | 26,855 |
| Luxembourg | — | 11,763 | 10,130 |
| France | 1,169 | 52,510 | 15,627 |
| Italy | 37 | 21,081 | 503 |
| Austria | 90 | 9,637 | 4,261 |
| Japan | 205 | 5,317 | 4,979 |
| USA | 1,014 | 314,733 | 10,730 |
| Other foreign countries | 1,265 | 122,155 | 9,968 |
| TOTAL | 43,165 | 1,346,680 | 488,172 |
| Iron and steel scrap and waste fit only for the recovery of metal | 874 | 195,273 | 17,768 |

### *Exports of Iron and Steel by Product*

| Product. | Month ended Sept. 30. | Nine months ended September 30. | |
|---|---|---|---|
| | 1961. | 1960. | 1961. |
| | Tons. | Tons. | Tons. |
| Pig-iron | 6,563 | 121,095 | 87,088 |
| Ferro-columbium (niobium) | 13 | 85 | 70 |
| Ferro-tungsten | 125 | 743 | 929 |
| Other ferro-alloys | 418 | 8,222 | 3,017 |
| Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms | 4,982 | 21,685 | 83,193 |
| Pieces roughly shaped by forging | 107 | 775 | 1,547 |
| Iron bars, rods, angles, shapes, and sections | 169 | 1,283 | 1,636 |
| Steel bars, rods, angles, sections, and shapes | 47,448 | 463,537 | 507,124 |
| Iron plates and sheets | 419 | 527 | 795 |
| Universal plates | 2,541 | 14,877 | 13,134 |
| Steel plate, 3 mm. and under 4.5 mm. thickness | 3,793 | 30,755 | 31,488 |
| Ditto, 4.5 mm. or more in thickness | 25,236 | 256,301 | 257,923 |
| Blacksheets and blackplate | 30,717 | 221,801 | 297,477 |
| Hoop and strip | 7,327 | 76,419 | 85,712 |
| Tinplate | 19,789 | 378,786 | 314,854 |
| Decorated tinplate | 194 | 4,515 | 4,876 |
| Galvanized sheets | 4,664 | 62,356 | 51,715 |
| Other (incl. tinned sheets, terneplate, and ternesheets) | 3,142 | 19,949 | 30,823 |
| Railway and tramway construction material | 14,946 | 123,250 | 153,726 |
| Wire rods of steel (incl. alloy steel) | 3,242 | 41,952 | 46,366 |
| Wire | 7,790 | 88,497 | 98,750 |
| Tubes, pipes, and fittings | 40,328 | 559,502 | 473,114 |
| TOTAL | 223,943 | 2,496,912 | 2,545,357 |

FOR THE FIRST time since April there are more unemployed registered with the Ministry of Labour than there are vacancies. This is revealed by the manpower returns for mid-October, which show that the number of unemployed rose by 48,574 to 365,607 in the five weeks ending October 16. By October 11 the number of vacancies had fallen to 289,210. A month earlier it was estimated that there were about 11,000 more jobs available than there were unemployed to fill them.

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# CURRENT PRICES OF IRON AND STEEL

November 3, 1961

**(Basic prices, delivered unless otherwise stated. Prices following side headings marked * are subject to an increase of 1 per cent. under Iron and Steel Board Price Determination, 1961, No. 2)**

## PIG-IRON

***Foundry and Forge Iron.**—No. 3 iron, Class 2, Middlesbrough, £21 17s.; Birmingham, £21 9s. 3d., 10-ton lots or over.

***Low-phosphorus Iron.**—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

***Basic Pig-iron.**—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

***Hematite.**—Si less than 2%, S & P 0·03-0·05%, 10-ton lots or over: N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s.; Birmingham, £25 13s.; South Wales (Welsh iron), £23 19s.

**Refined.**—Cylinder and refined irons, South Zone, £25 9s., North Zone, £25 6s. 6d. Refined malleable, max. 0·10% P, South Zone £26 9s., North Zone £26 6s. 6d.

## MANUFACTURED IRON

(*Bar basis, 2½ in. to ¾ in.*)

CROWN IRON: England and Wales (Zone 1), £51 12s. 6d.; Scotland, £51 7s. 6d.; Ireland, f.o.q. Belfast, £54 12s. 6d., all other Northern Ireland ports, £55 12s. 6d., f.o.q. Cable iron, £1 extra.

## SEMI-FINISHED STEEL

***Re-rolling Billets, Blooms, and Slabs.**—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 100 tons and over, £32 5s. 6d.; hard (0·41-0·60% C), 50 tons and over, £33 17s.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting steel up to 0·25% C, 50 tons and over, £35 4s. 6d. SIEMENS-MARTIN ACID (50 tons and over): Up to 0·25% C, £40 11s.; silico-manganese, £43 4s.

***Billets, Blooms, and Slabs for Forging and Stamping.**—Lots of 50 tons and over. Basic, soft, up to 0·33% C, £37; basic, hard, over 0·41 up to 0·60% C, £38 2s. 6d.; acid, up to 0·25% C, £41 14s.; acid silico-manganese, £44 17s.

**Alloy Steel** (25 tons and over).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £47 3s., Ni 2·75/3·75%, Cr 0·5/1·10%, £76 5s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo. 0·2/0·65% £86 14s. BARS: 1 in. dia. and up, nickel, £67 16s.; nickel-chrome, £100 18s.; nickel-chrome-molybdenum, £113 11s.

***Other Semi-products, etc.**—Forging ingots, up to 0·60% C, £32 (gross) f.o.t.; tube billets, 50 tons and over, £39 10s.; shell steel billets for direct forging, up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland). 50 tons and over: Soft basic, £39 17s.; hard basic, £43 8s.; free-cutting, up to 0·25% C, £45; acid, up to 0·75% C, £54 6s. 6d. Stainless steel billets, 3 in. and larger, 10 tons and over, Austenitic, £228 10s.; martensitic, £133.

## FINISHED STEEL

***Heavy Products** (50 tons and over).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £40 7s.; medium plates, all areas of England and Wales, £43 16s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £42 17s.; floor plates, N.-E. Coast, £41 16s. Sections (N.-E. Coast, Midland and Northern Joint Areas, and Central Scotland): Angles, £38 1s. 6d.; bars (rounds and squares), £40 11s. 6d.; flats, £38 6s. 6d.; joists, £37 17s. 6d.

***Rolled and Re-rolled Steel Products.**—N.-E. Coast, Midland, Northern Joint and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 united in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £44 9s. 6d.; hard basic, £41 19s. 6d.; Siemens-Martin acid, £49 12s. 6d.; spring steel, basic, £44 4s. 6d. spring steel, acid, £53 11s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

***Sheets and Strip.**—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £66 17s. Cold-rolled steel strip, coils, hard temper, not annealed, 20 tons and over, £54 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

***Tinplates and Blackplate.**—Cold reduced, hot dipped, 15 tons to under 50 tons, 67s. 1d. per basis box of 108 lb., f.o.t. maker's works. Cold reduced electrolytic tinplate, 59s. 10d. per basis box, f.o.t. Cold reduced blackplate, 57s. 2d. per basis box, f.o.t.

***Colliery Rails and Arches.**—Arches, 4 in. × 2½ in. × 2 in., re-rolled, £38 15s.; 3 in. × 3 in., re-rolled, £39; 3½ in. × 3½ in., re-rolled, £40 7s. 6d.; 4 in. × 2½ in. × 2 in., prime £43 7s. 6d. Other sections, prime, £43 12s. 6d. Extra fish-plates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled, £37 9s.; 3 in. × 3 in., re-rolled, £37 11s. 6d.; 3½ in. × 3½ in., re-rolled, £38 18s. 6d.; 4 in. × 2½ in. × 2 in., prime. £42 4s. 6d. Other sections, prime, £42 7s. Benk bars; standard type, prime material, all thicknesses, £38 11s, "W" type bars, prime steel, all thicknesses, £41 1s. Standard type, re-rolled, up to ⅜ in., inclusive, £36 3s. 6d., over ⅜ in. to ½ in., inclusive, £37 8s. 9d. "W" type bars, re-rolled, up to ⅜ in., inclusive, £38 13s. 6d.; over ⅜ in. to ½ in., inclusive, £39 18s. 6d. Light rails, flange, 25 lb. and under, prime, £40 17s. 6d. Flange rails, 25 lb. and under, re-rolled, £39 15s. Fishplates, £50 12s. 6d.

***Bright Steel** (50 tons and over).—Bars, no analysis or test, £53 5s.; flats, untested, £70 16s. 6d.

**High-speed Tool Steel.**—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

***Rails, etc.**—F.B. rails, 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.

## BLAST-FURNACE COKE

(*F.O.T. at Ovens*)

DURHAM AND NORTH-EAST COAST: 177s. 6d. SOUTH WALES: 174s. 7d. NOTTS AND DERBY: 150s. 7d. LANCASHIRE: 162s. 7d. STAFFORDSHIRE: 156s. 2d. YORKSHIRE: 155s. 1d. SCOTLAND: 187s. 11d. All prices subject to quality differentials.

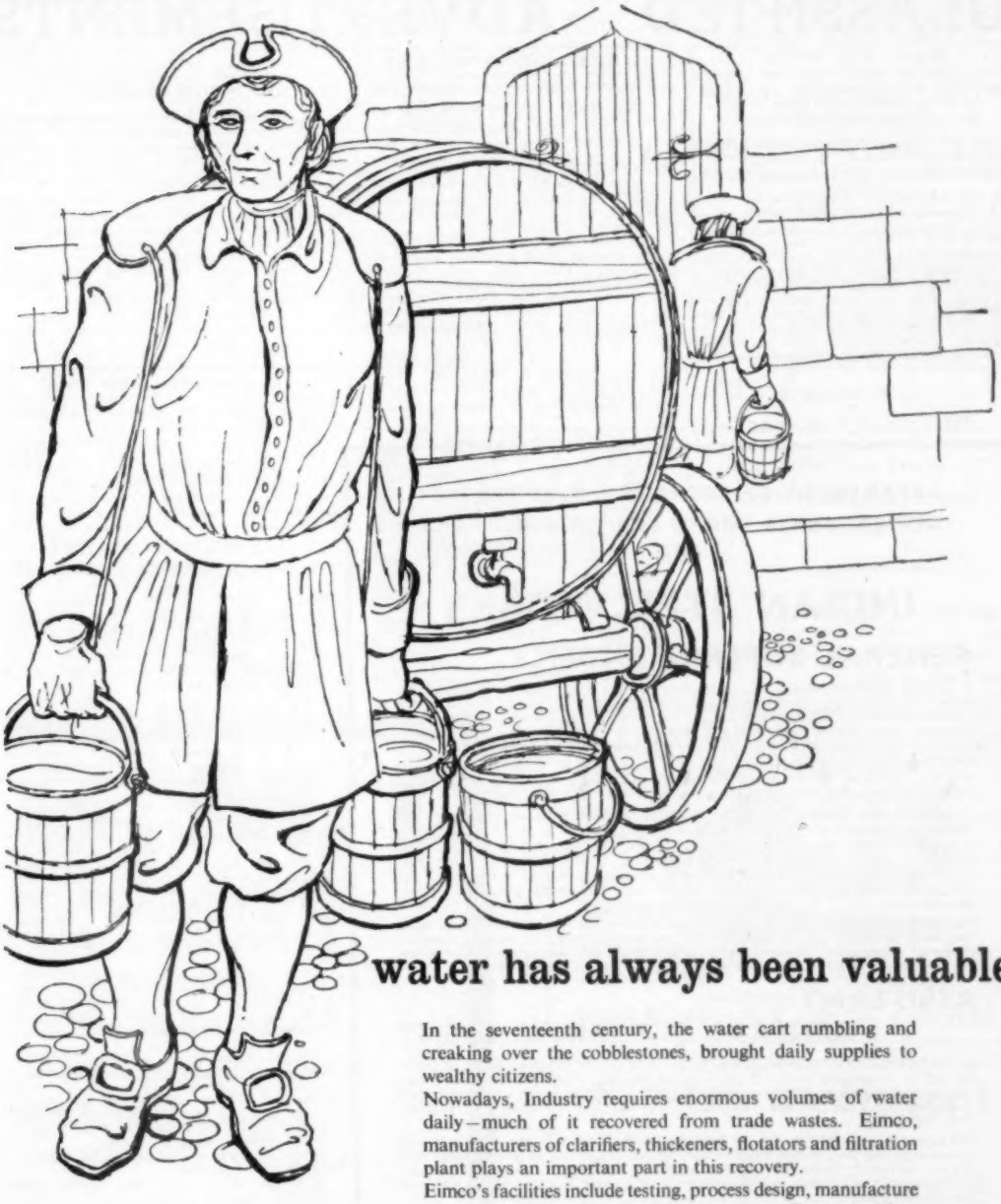
## STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

| | Scotland. | N.-E. Coast. | Midlands. | Sheffield. | Lancs. | S. Wales (East) | S. Wales (West) |
|---|---|---|---|---|---|---|---|
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Heavy steel scrap* .. .. | 229 3 | 228 3 | 220 0 | 226 3 | 226 3 | 227 3 | 232 3 |
| Heavy mixed scrap* .. .. | 207 3 | 206 3 | 198 6 | 204 3 | 203 9 | 205 3 | 210 3 |
| Heavy steel turnings† .. | 179 9 | 179 9 | 169 9 | 176 9 | 174 3 | 177 0 | 180 0 |
| Heavy cast iron† | 206 9 | 203 9 | 208 0 | 204 3 | 189 3 | 199 3 | 205 9 |
| Cast-iron borings† | 160 3 | 157 3 | 157 0 | 159 9 | 157 3 | 159 6 | 164 6 |

* Not less than 500 tons delivered within three months.

† Not less than 250 tons delivered within three months.



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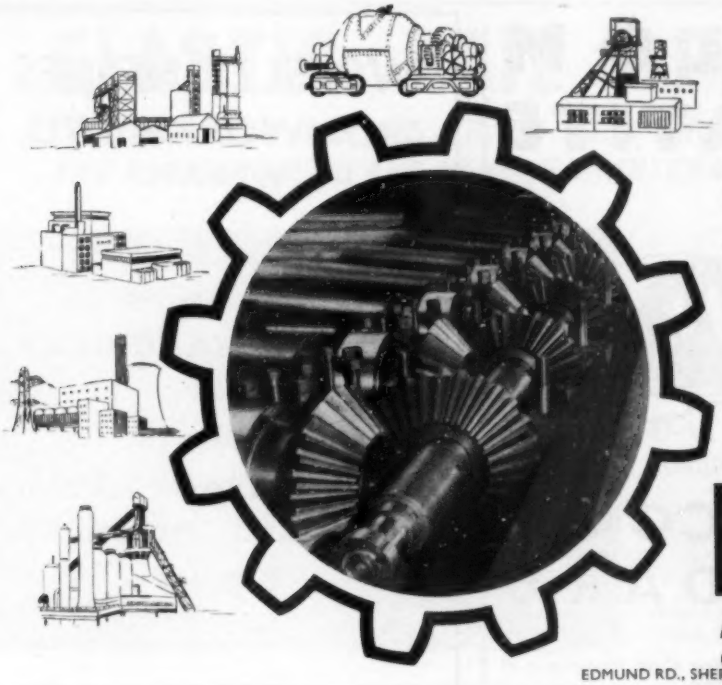

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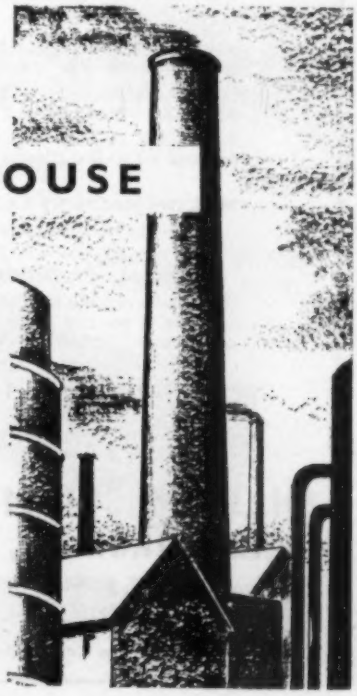

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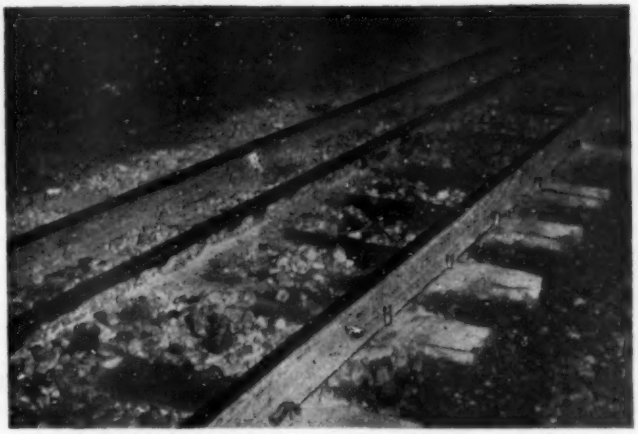

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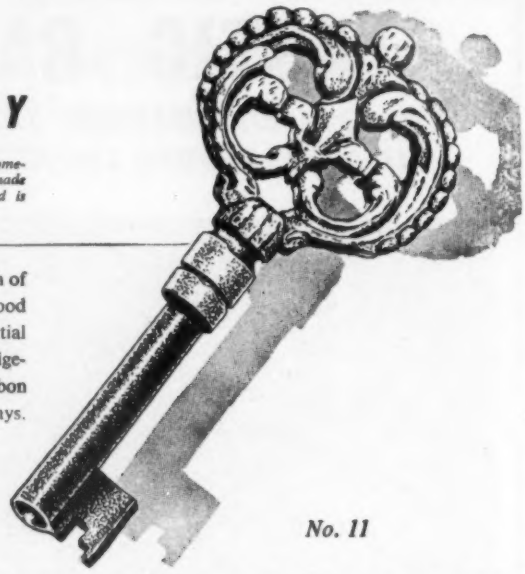

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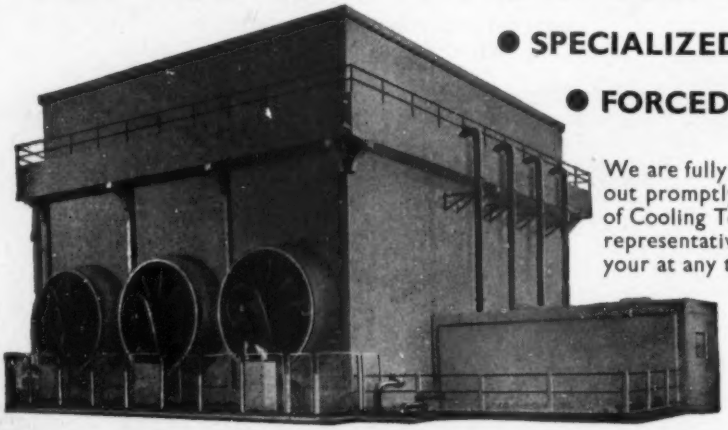

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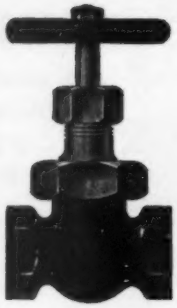

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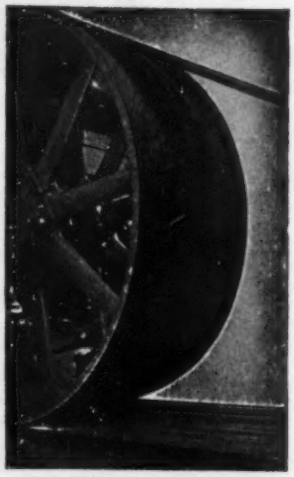

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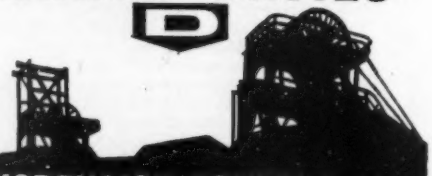

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Fig. 1.

Fig. 2.

Fig 3.

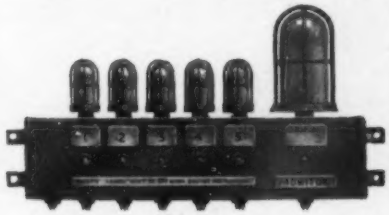

Fig. 4.

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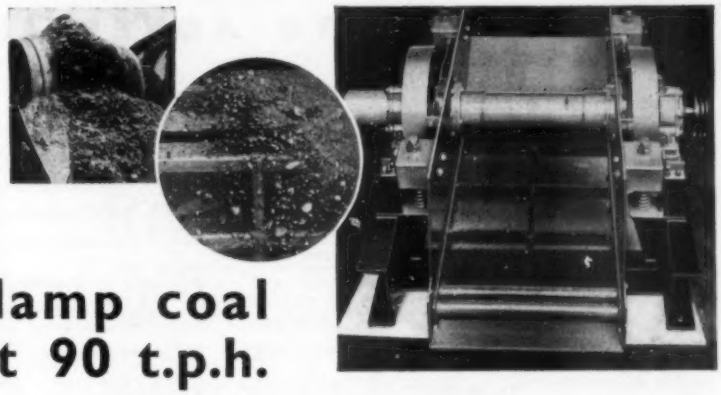

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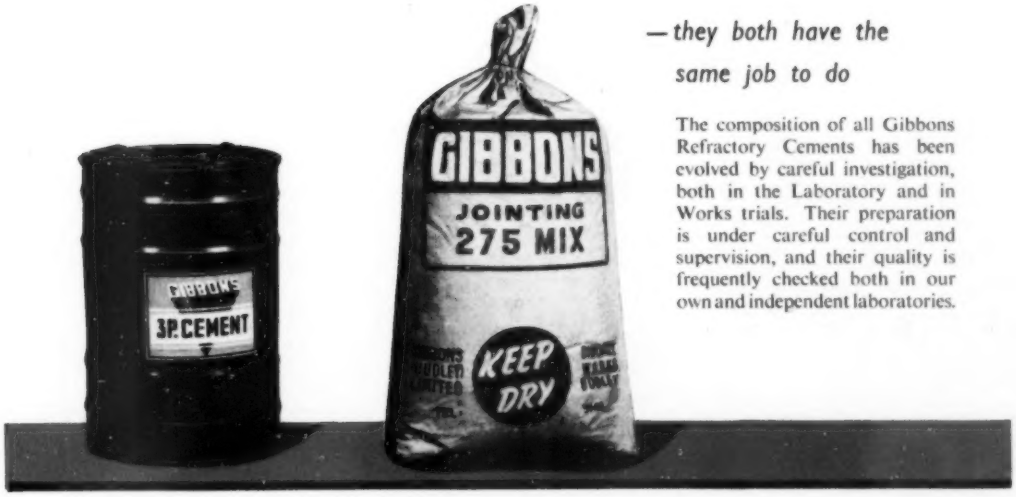


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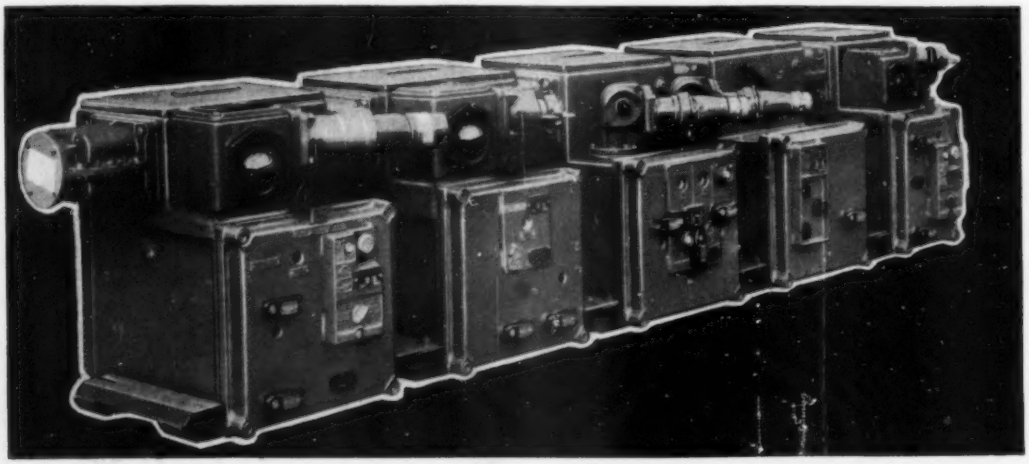

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